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The Gift of
The Secretary of State of
Ohio.

Rec.^d 25 Jan. 1868.

NINTEENTH ANNUAL REPORT

OF THE

Ohio State Board of Agriculture,

WITH

AN ABSTRACT OF THE PROCEEDINGS

OF THE

COUNTY AGRICULTURAL SOCIETIES:

TO THE

GENERAL ASSEMBLY OF OHIO, FOR THE YEAR 1864.

COLUMBUS:
RICHARD NEVINS, STATE PRINTER.
1865.

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1868. Jan. 25
Gift of the
Secretary of State
of Ohio.

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1864.

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1865.

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N. J. TURNEY, *President*, T. C. JONES, D. McMILLEN, Jr.,
DAVID TAYLOR.

---

* Killed on railroad May 21, 1864.

ERRATA.

On page 313, for—
40. " Cape Colony and Natal, 1,350,000," read "Australia, 1,350,000;" then add—
"41. Cape Colony and Natal, 869,000."
Page 434, second line from top, read "drainage is *not* necessary."

Page 21 of Appendix, eighth paragraph, for " Shenango," read "Chenango."
Page 43, " third paragraph, for President "Walker," read "Warder."
Page 54, " third paragraph, for J. P. "Duke," read "Dake."
Page 54, " fifth paragraph, for "Dr. Miller," read "Mr. Miller."
Page 58, " sixth paragraph, for "purple cone," read "p. cane."
Page 69, " signature, for "G. W. Carpenter," read "G. W. Campbell."

TREASURER'S STATEMENT.

RECEIPTS.

1864—Jan'y.	Balance on hand at last settlement		$9,676 07
May.	Received of Treasurer of State	$1,800 00	
Aug. 2.	" " "	1,500 00	
			3,300 00
Aug. 20.	" " " old appropriation		522 75
Aug.	Subscription of Columbus City		5,000 00
	Interest on 5-20 bonds	222 28	
	Premium " "	500 00	
			722 28
Sep. 13.	Gate receipts at State Fair	677 75	
" 14.	" " "	2,550 00	
" 15.	" " "	6,665 52	
" 16.	" " "	2,158 60	
			12,051 87
	Permits and refreshments		569 80
	Total receipts for 1864		31,842 17

DISBURSEMENTS.

Premiums of 1863 paid in 1864	558 00	
" of 1864	3,582 00	
		4,140 00
Sundry claims of 1863 paid in 1864		$1,358 57
Office expense	385 30	
Express	80 00	
Postage	168 67	
Printing and advertising	1,075 15	
J. H. Klippart, balance on salary of 1863	265 37	
" sundries, per bill	234 63	
" salary 1864	1,500 00	
		3,708 82
STATE FAIR GROUNDS.		
A. Carlisle, lumber	8,589 39	
W. P. Needles, pumps	91 70	
Schneider & Tice, digging wells	329 50	
Charles A. Wagner, flags	34 00	
Hemmersbach & Jolly, music	300 00	
A. Fitch, freight & storage	67 00	
Marshals, superintendents and police	1,066 90	
Kilbourne, Kuhns & Co., hardware	344 90	
Sundry other hardware	30 55	
Hay and straw	751 96	
Keckle Rodenfels & Derrick, refreshments	236 70	
Neil House, refreshments	295 25	
Sundry labor on grounds	2,054 96	
		14,191 81
Amount paid Ohio Pomological Society	300 00	
" " premiums on 5-20 bonds	210 00	
" " sundry expenses	23 78	
		533 78
Cash on hand		7,909 19
		31,842 17

OHIO STATE AGRICULTURAL ROOMS,
COLUMBUS, *January* 3, 1865.

The undersigned committee to examine accounts and vouchers of David Taylor, Treasurer of the Ohio State Board of Agriculture, beg leave to report as follows: We find the Treasurer had

On hand at last settlement		$9,676 37
Gross receipts in 1864		22,165 80
		31,842 17
Paid on claims of 1863	$1,916 57	
" Ohio Pomological Society	300 00	
" on general disbursement	21,716 41	
Cash on hand	7,909 19	
		31,842 17

Respectfully submitted,

WM. F. GREER,
WM. R. PUTNAM,
Committee.

Number and Value of Horses, Cattle and Mules, in Ohio, for 1865.

COUNTIES.	HORSES.		CATTLE.		MULES.	
	No.	Value.	No.	Value.	No.	Value.
Adams	6,760	$434,072	12,159	$195,752	171	$12,355
Allen	7,085	352,458	11,898	128,392	121	6,293
Ashland	7,754	430,256	13,428	175,563	102	2,836
Ashtabula	8,991	439,781	25,202	387,618	179	5,634
Athens	5,907	360,259	12,619	222,372	64	3,675
Auglaize	6,269	329,521	10,437	128,664	270	11,785
Belmont	10,531	737,177	13,917	309,812	124	8,891
Brown	9,082	653,981	12,367	237,524	424	27,757
Butler	11,055	925,996	12,623	311,673	262	25,407
Carroll	4,515	287,758	7,627	127,313	26	1,965
Champaign	9,048	671,209	14,681	343,839	236	17,505
Clarke	9,137	660,949	13,873	317,401	246	17,615
Clermont	9,760	708,456	11,689	263,738	630	52,387
Clinton	9,620	653,593	13,674	325,931	425	30,146
Columbiana	8,330	514,620	12,801	210,565	149	10,755
Coshocton	7,602	492,760	13,538	217,710	153	4,578
Crawford	8,081	453,448	14,417	199,563	59	3,626
Cuyahoga	10,889	683,742	17,051	369,952	93	9,167
Darke	10,620	638,155	18,159	252,552	77	4,965
Defiance	4,839	244,748	9,077	91,667	18	810
Delaware	7,681	516,739	11,985	216,341	281	17,365
Erie	5,613	391,508	7,180	158,470	23	575
Fairfield	10,544	560,019	18,271	269,493	384	16,648
Fayette	9,323	627,395	18,711	673,897	289	18,584
Franklin	12,785	851,039	16,992	397,113	256	18,820
Fulton	5,218	197,897	11,319	99,629	39	1,377
Gallia	5,333	359,524	11,520	184,988	171	12,583
Geauga	5,002	357,752	18,819	490,882	103	5,150
Greene	10,271	781,614	16,390	367,506	337	26,655
Guernsey	6,965	415,357	10,904	172,137	225	11,942
Hamilton	17,139	1,464,849	16,128	462,247	607	68,570
Hancock	8,873	362,188	16,439	143,134	164	4,236
Hardin	5,778	315,769	10,608	142,733	140	7,385
Harrison	5,344	344,650	8,182	123,448	64	3,286
Henry	3,244	140,379	6,578	63,959	17	595
Highland	11,066	676,256	16,753	304,872	954	51,925
Hocking	4,864	248,681	8,861	99,897	46	2,835
Holmes	6,605	349,825	11,915	130,637	63	3,457
Huron	9,634	521,369	15,886	250,952	294	5,209
Jackson	4,213	251,544	11,048	180,701	102	7,876
Jefferson	5,947	388,883	8,780	163,553	39	2,130
Knox	9,865	501,812	10,248	169,366	107	5,345
Lake	4,171	247,651	8,593	185,161	41	1,867
Lawrence	3,796	283,103	10,971	235,845	149	14,410
Licking	12,061	736,228	17,213	329,032	167	10,246
Logan	7,787	503,174	13,123	233,929	316	23,716
Lorain	9,516	558,168	20,613	380,207	51	2,383
Lucas	4,602	248,900	7,270	104,369	50	2,830
Madison	7,257	486,655	14,180	522,995	346	23,455
Mahoning	7,086	443,504	13,744	286,977	225	14,355
Marion	7,050	423,958	13,635	387,245	152	13,545
Medina	7,370	459,601	14,088	253,313	41	2,705
Meigs	4,847	350,826	10,982	219,801	193	14,785
Mercer	6,248	308,382	11,217	108,824	24	1,590
Miami	9,341	713,071	12,131	221,383	270	18,988
Monroe	5,809	358,872	12,316	248,283	78	3,430
Montgomery	11,726	932,715	16,457	266,750	66	5,590

Number and Value of Horses, Cattle and Mules, in Ohio, for 1865—Con.

COUNTIES.	HORSES.		CATTLE.		MULES.	
	No.	Value.	No.	Value.	No.	Value.
Morgan	6,516	$413,927	12,167	$186,816	84	5,730
Morrow	7,057	374,781	11,166	172,864	123	7,738
Muskingum	10,842	637,747	20,617	346,029	267	11,961
Noble	6,555	416,281	12,795	189,228	106	6,575
Ottawa	2,752	148,190	4,311	68,290	1	50
Paulding	1,942	78,173	5,291	65,715	10	770
Perry	6,002	309,936	12,695	146,957	100	4,095
Pickaway	10,668	703,334	32,011	861,235	876	66,191
Pike	4,300	287,182	7,447	133,547	125	9,707
Portage	7,382	439,536	20,199	442,380	63	3,206
Preble	8,340	711,651	13,348	257,914	118	9,363
Putnam	5,658	210,257	13,566	118,124	62	4,138
Richland	9,638	732,121	16,222	381,798	82	6,996
Ross	11,615	914,410	20,703	550,434	470	41,429
Sandusky	7,902	398,539	13,338	145,669	24	1,400
Scioto	4,958	341,240	10,192	188,918	267	28,461
Seneca	10,405	585,036	16,486	184,295	46	3,375
Shelby	7,026	408,026	10,198	138,317	68	5,259
Stark	11,881	734,634	21,111	316,919	75	7,183
Summit	6,814	522,525	14,937	346,035	62	5,970
Trumbull	9,562	586,129	25,841	546,763	291	18,880
Tuscarawas	8,705	484,625	16,710	225,716	111	7,050
Union	7,780	460,529	11,578	256,247	314	17,281
Van Wert	4,250	204,641	9,150	92,525	43	2,630
Vinton	3,053	186,495	7,275	140,392	109	7,375
Warren	9,945	780,643	12,275	299,850	172	13,077
Washington	7,485	501,228	15,348	302,346	170	14,040
Wayne	11,436	615,657	24,990	281,844	149	8,740
Williams	5,828	285,849	10,931	118,459	21	1,245
Wood	6,807	323,585	13,589	166,258	31	1,536
Wyandot	6,691	689,196	11,434	193,110	91	6,307
Total	675,644	42,538,879	1,199,208	21,932,694	15,186	1,032,533

Number and Value of Sheep and Hogs in Ohio, for 1865.

COUNTIES.	SHEEP.		HOGS.	
	No.	Value.	No.	Value.
Adams	28,328	$84,274	21,380	$68,676
Allen	46,099	124,063	21,832	66,267
Ashland	96,910	312,782	15,079	54,072
Ashtabula	106,203	260,722	4,460	14,492
Athens	64,794	227,943	10,690	49,591
Auglaize	29,315	70,429	19,972	49,940
Belmont	143,648	633,928	16,462	102,220
Brown	28,912	110,497	26,129	108,976
Butler	13,628	63,658	27,886	180,932
Carroll	125,993	437,877	7,063	32,953
Champaign	65,046	269,164	20,045	100,688
Clarke	69,657	289,407	19,298	113,364
Clermont	24,806	94,564	22,779	99,821
Clinton	51,762	189,894	34,994	117,521
Columbiana	156,500	489,012	11,691	57,042
Coshocton	139,352	604,514	15,434	83,041
Crawford	98,911	343,142	20,219	82,352
Cuyahoga	72,594	211,563	6,667	41,403
Darke	31,939	102,717	27,662	96,760
Defiance	24,568	64,155	11,049	26,234
Delaware	108,210	510,745	15,659	85,131
Erie	6,086	199,557	7,207	38,229
Fairfield	55,751	169,243	28,346	140,926
Fayette	60,808	248,310	37,859	219,145
Franklin	48,058	214,855	34,055	193,979
Fulton	48,963	96,978	8,797	18,548
Gallia	30,528	81,174	13,290	45,472
Geauga	59,510	182,691	2,585	17,393
Greene	47,101	168,596	28,821	170,785
Guernsey	133,859	476,504	10,350	57,560
Hamilton	7,064	27,944	21,726	112,142
Hancock	67,112	166,840	25,155	46,503
Hardin	39,220	142,400	15,896	45,558
Harrison	175,061	661,228	7,410	34,922
Henry	13,757	36,896	8,277	14,673
Highland	52,390	131,094	40,110	149,713
Hocking	35,107	95,669	10,789	36,106
Holmes	73,338	214,902	13,666	57,454
Huron	147,820	369,117	11,694	56,207
Jackson	28,733	75,026	9,787	26,784
Jefferson	149,161	504,654	8,457	48,817
Knox	143,080	581,059	15,810	78,906
Lake	50,389	149,850	2,372	16,983
Lawrence	13,209	34,339	13,812	49,470
Licking	236,494	995,273	19,035	118,905
Logan	63,729	229,858	16,602	70,977
Lorain	164,395	505,516	8,526	40,679
Lucas	21,842	44,323	7,208	14,950
Madison	133,943	593,881	12,244	108,473
Mahoning	114,847	378,850	8,013	45,742
Marion	113,654	534,253	26,660	88,283
Medina	147,603	481,261	7,413	37,948
Meigs	34,523	102,261	9,988	41,133
Mercer	29,084	68,041	20,522	49,805
Miami	23,955	96,168	19,513	128,027
Monroe	44,844	147,796	11,258	47,294
Montgomery	13,907	48,445	24,212	131,476

Number and Value of Sheep and Hogs in Ohio, for 1865—Continued.

COUNTIES.	SHEEP.		HOGS.	
	No.	Value.	No.	Value.
Morgan	74,745	$246,220	12,468	$60,412
Morrow	99,847	390,300	13,243	57,295
Muskingum	156,218	480,296	23,430	119,420
Noble	62,779	204,342	12,477	63,172
Ottawa	17,298	42,199	5,825	15,870
Paulding	6,253	16,583	6,112	12,106
Perry	84,397	253,102	13,175	45,658
Pickaway	43,421	174,275	47,018	302,648
Pike	19,509	56,716	13,684	54,346
Portage	121,124	426,036	5,880	33,852
Preble	18,036	83,078	26,472	155,306
Putnam	29,460	69,307	3,763	7,759
Richland	95,953	382,533	22,790	122,768
Ross	39,704	146,003	37,340	208,930
Sandusky	52,821	113,356	17,098	46,364
Scioto	13,235	34,431	12,354	50,231
Seneca	116,448	335,583	21,681	77,666
Shelby	39,254	153,738	15,900	62,331
Stark	132,990	345,603	24,026	127,153
Summit	82,314	409,133	8,803	52,113
Trumbull	125,838	437,827	6,281	45,124
Tuscarawas	132,072	418,929	17,691	418,929
Union	73,996	311,932	14,461	73,230
Van Wert	21,365	54,124	15,370	27,133
Vinton	34,661	116,473	6,080	23,962
Warren	21,784	105,461	23,119	160,579
Washington	60,477	218,227	12,478	62,734
Wayne	129,977	340,142	25,597	77,937
Williams	42,725	124,452	10,861	30,356
Wood	39,788	103,556	13,397	28,274
Wyandot	91,663	389,727	13,035	65,098
Total	6,227,252	$21.729,786	1,455,695	$6,961,196

Statement showing the amount of Wheat, Rye, Barley and Buckwheat, 1864.

COUNTIES.	WHEAT.		RYE.		BARLEY.		BUCKWHEAT.	
	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.
Adams	20,625	111,884	63	393	115	1,476	87	1,045
Allen	17,797	128,177	270	2,484	373	5,330	807	10,126
Ashland	17,894	86,290	1,214	11,976	3,619	52,739	2,244	31,153
Ashtabula	4,432	44,712	141	1,485	264	2,331	796	10,244
Athens	14,112	90,820	88	996	15	202	427	6,086
Anglaize	14,523	143,230	334	3,188	2,634	36,852	604	7,833
Belmont	21,230	162,026	539	8,074	2,573	48,114	1,223	14,578
Brown	26,991	256,740	539	4,104	284	5,390	106	1,408
Butler	39,972	538,850	166	1,537	11,644	289,151	146	1,201
Carroll	11,205	54,038	2,883	15,217	1,021	15,801	1,884	96,871
Champaign	34,042	548,651	380	5,466	1,294	34,827	273	4,045
Clark	29,163	449,963	992	16,076	716	19,653	124	1,743
Clermont	19,458	132,529	467	4,394	667	1,193	197	2,550
Clinton	24,684	248,218	215	2,590	483	11,887	197	2,430
Columbiana	15,134	79,518	1,979	15,758	808	11,209	1,757	24,844
Coshocton	25,915	227,585	1,400	12,984	436	8,272	2,092	30,729
Crawford	15,949	212,958	416	5,929	2,551	51,167	488	5,438
Cuyahoga	3,026	15,121	622	6,367	495	8,281	672	8,578
Darke	37,907	493,513	688	8,982	5,166	114,370	402	4,488
Defiance	15,751	208,912	73	919	109	1,909	412	6,065
Delaware	12,781	115,334	658	6,310	745	10,617	1,084	15,326
Erie	11,771	61,960	81	1,054	1,815	46,761	836	10,935
Fairfield	39,987	310,525	1,272	15,278	1,839	39,075	392	5,213
Fayette	14,377	142,188	642	8,832	26	389	104	1,246
Franklin	22,773	207,107	805	9,714	2,060	42,460	873	11,000
Fulton	13,725	188,981	94	1,349	59	1,116	948	11,867
Gallia	17,937	97,610	68	713	20	88	218	2,017
Geauga	2,117	14,698	195	2,499	117	1,795	640	7,560
Greene	31,450	440,880	394	5,701	1,365	35,794	142	1,907
Guernsey	14,001	96,680	991	9,721	528	7,705	1,518	19,724
Hamilton	13,407	163,563	488	5,898	4,974	125,189	153	2,336
Hancock	24,649	119,361	221	2,764	779	9,889	1,100	18,340
Hardin	15,718	165,442	238	3,169	130	2,336	686	6,920
Harrison	10,702	77,089	833	9,302	629	13,277	1,060	14,981
Henry	8,036	108,709	37	408	66	1,097	349	4,323
Highland	41,395	345,715	175	2,379	60	1,157	151	1,959
Hocking	18,071	101,181	528	4,636	81	1,167	470	5,201
Holmes	24,580	318,440	1,910	19,570	1,444	20,160	1,770	24,640
Huron	17,847	152,503	76	1,062	2,070	40,379	930	11,335
Jackson	17,341	78,169	56	312	——	——	119	1,288
Jefferson	14,028	105,262	906	11,173	2,541	61,802	773	10,144
Knox	16,568	77,981	1,552	15,569	1,306	20,326	2,760	40,646
Lake	3,768	36,815	72	1,178	912	18,589	303	4,686
Lawrence	11,969	71,701	139	1,026	19	551	168	1,651
Licking	21,738	179,135	2,527	26,692	485	9,388	1,908	29,961
Logan	26,503	306,018	285	3,600	498	8,548	543	7,453
Lorain	5,764	22,071	139	1,411	1,564	21,589	715	10,495
Lucas	7,606	96,753	154	1,687	200	5,090	691	8,283
Madison	8,685	79,214	531	5,591	195	3,593	187	2,346
Mahoning	9,135	42,342	741	5,196	759	11,863	1,350	17,102
Marion	15,052	168,402	237	3,059	679	12,858	399	5,167
Medina	7,688	27,259	392	3,823	2,539	27,477	1,151	14,737
Meigs	15,159	116,527	154	1,490	80	1,028	236	2,723
Mercer	18,807	172,494	338	3,418	1,031	17,656	642	8,900
Miami	37,262	497,177	267	3,908	3,847	96,718	185	2,407
Monroe	15,083	115,802	1,006	7,396	322	4,026	1,096	14,815
Montgomery	37,793	553,054	584	8,955	4,788	113,807	185	3,141
Morgan	18,637	176,429	157	1,714	154	2,661	717	9,940
Morrow	7,784	63,353	289	6,633	810	12,926	1,671	22,963

***Statement showing the amount of Wheat, Rye, Barley, &c.*, 1864—Continued.**

COUNTIES.	WHEAT.		RYE.		BARLEY.		BUCKWHEAT.	
	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.	Acres.	Bushels.
Muskingum ..	28,186	241,442	905	11,013	587	9,331	1,170	15,556
Noble	16,016	134,568	224	2,597	35	561	648	9,081
Ottawa	4,460	30,652	67	388	271	2,943	317	4,417
Paulding	4,401	49,033	26	239	26	506	143	2,200
Perry	19,409	125,920	631	6,288	358	9,514	970	13,098
Pickaway	27,564	171,129	589	8,223	384	7,384	268	5,504
Pike	13,479	75,761	82	714	25	369	95	862
Portage	8,591	44,135	901	8,362	1,385	24,158	1,147	14,494
Preble	35,864	438,552	229	2,248	2,788	62,755	113	1,724
Putnam	13,102	129,522	257	2,615	89	1,027	707	9,488
Richland	25,516	264,440	1,876	19,894	3,255	50,179	1,904	28,698
Ross	33,214	252,765	442	4,962	226	2,412	130	1,500
Sandusky	21,425	174,642	217	2,181	253	4,495	1,032	10,915
Scioto	13,709	94,172	11	59	151	4,212	53	559
Seneca	34,217	460,061	298	3,046	1,456	23,682	983	10,351
Shelby	22,504	218,250	356	3,542	1,439	24,256	547	6,539
Stark	36,205	252,133	1,059	11,374	9,593	182,732	1,604	18,526
Summit	13,953	55,156	660	6,827	4,246	73,347	1,128	13,642
Trumbull	4,964	30,188	615	3,947	52	836	1,503	16,521
Tuscarawas ..	27,059	173,869	1,692	19,034	2,363	38,433	2,290	37,571
Union	14,166	128,930	312	3,757	51	1,148	769	12,188
Van Wert	10,458	79,341	247	2,379	262	4,518	623	9,534
Vinton	8,330	39,395	63	554	6	160	283	2,972
Warren	29,433	437,805	155	1,792	5,339	127,876	488	6,991
Washington ..	24,713	190,153	543	5,114	45	631	985	14,298
Wayne	33,154	146,127	1,025	10,499	4,469	67,577	2,141	30,616
Williams	17,642	238,944	90	1,082	185	2,685	397	5,943
Wood	13,073	135,633	114	1,164	597	11,734	1,381	15,945
Wyandot	14,724	172,297	169	2,322	723	11,276	648	9,538
Totals	1,650,338	15,432,169	47,460	499,315	117,453	2,321,739	68,223	995,594

STATEMENT SHOWING THE CROPS, &c.—Continued.

COUNTIES.	CORN.		OATS.		MEADOW.	
	Acres.	Bushels.	Acres.	Bushels.	Acres.	Tons.
Adams	23,283	435,301	4,823	94,348	5,359	3,975
Allen	19,465	515,263	3,421	88,451	7,637	6,079
Ashland	19,556	54,634	12,094	313,184	18,682	17,636
Ashtabula	9,460	352,153	7,127	15,923	42,155	3,965
Athens	14,468	414,719	2,666	57,774	13,118	14,267
Auglaize	15,865	325,764	5,511	115,268	5,557	4,959
Belmont	21,960	678,997	14,806	323,769	18,748	18,162
Brown	34,826	833,285	7,447	145,406	9,648	7,909
Butler	46,905	1,252,636	8,193	177,526	6,424	6,521
Carroll	9,603	247,193	9,060	200,740	14,267	13,130
Champaign	31,722	936,429	7,973	199,660	11,113	11,914
Clark	28,232	842,122	6,071	173,842	10,473	11,909
Clermont	29,141	655,632	11,586	285,320	16,816	16,213
Clinton	41,393	1,344,467	5,861	145,063	12,005	11,192
Columbiana	12,761	301,002	13,575	277,711	19,754	17,571
Coshocton	27,272	772,666	6,956	156,272	15,161	14,946
Crawford	17,882	673,850	9,703	298,673	13,550	15,943
Cuyahoga	9,757	366,968	7,258	196,962	34,232	34,792
Darke	34,811	167,973	8,175	181,572	6,132	7,385
Defiance	9,086	190,257	3,028	62,315	6,815	5,606
Delaware	27,489	806,505	4,918	132,086	20,073	19,254
Erie	15,883	402,173	6,353	200,528	10,699	12,676
Fairfield	41,306	1,153,208	8,260	186,659	14,552	12,430
Fayette	49,802	1,774,288	2 231	64,167	7,388	6,092
Franklin	49,714	1,378,938	7,016	165,004	13,621	12,980
Fulton	9,419	299,158	3,571	104,976	11,154	12,159
Gallia	21,000	488,057	4,656	109,614	9,690	10,059
Geauga	5,202	169,076	5,142	123,534	31,980	24,565
Greene	41,321	1,296,661	5,044	147,483	7,570	8,589
Guernsey	17,619	484,045	15,272	179,910	17,379	16,329
Hamilton	27,163	836,938	8,322	216,073	14,060	15,921
Hancock	33,385	639,696	6,198	157,528	10,757	11,362
Hardin	16,073	410,942	2,988	69,908	8,799	8,450
Harrison	13,432	453,374	7,677	218,072	18,780	19,703
Henry	6,821	178,455	1,406	33,133	4,167	4,123
Highland	47,148	1,107,049	4,359	94,202	14,213	9,494
Hocking	14,777	329,549	3,327	57,773	7,803	6,780
Holmes	18,578	447,755	8,886	187,144	11,720	12,555
Huron	21,278	683,949	10,675	333,111	25,744	27,354
Jackson	14,746	211,309	4,275	66,510	9,812	8,207
Jefferson	12,115	398,305	9,976	279,418	15,969	16,643
Knox	28,062	749,530	7,531	192,048	20,054	18,662
Lake	5,289	212,368	2,718	64,671	14,783	14,793
Lawrence	16,876	444,798	2,650	35,332	3,151	3,486
Licking	40,366	1,253,801	8,355	205,681	27,497	27,162
Logan	26,919	619,810	4,719	108,232	11,440	12,588
Lorain	4,204	439,595	7,214	318,296	34,431	37,517
Lucas	6,730	269,147	1,936	53,935	10,282	11,394
Madison	33,538	1,187,774	23,217	77,969	14,243	14,263
Mahoning	9,511	291,857	9,561	227,476	26,458	23,256
Marion	23,476	772,685	6,168	171,279	15,491	15,557
Medina	12,431	344,190	11,283	355,940	30,712	29,897
Meigs	14,639	307,514	3,364	71,757	12,050	13,839
Mercer	17,822	447,645	4,965	78,329	5,818	5,574
Miami	34,060	872,865	9,839	249,980	6,115	4,902
Monroe	14,938	367,540	17,976	138,901	10,525	8,381
Montgomery	30,580	676,172	10,781	291,063	6,484	5,796
Morgan	14,894	424,334	3,448	64,422	12,470	10,583

STATEMENT SHOWING THE CROPS, &c.—Continued.

COUNTIES.	CORN.		OATS.		MEADOW.	
	Acres.	Bushels.	Acres.	Bushels.	Acres.	Tons.
Morrow	16,940	438,735	7,555	273,609	19,491	18,806
Muskingum	26,544	862,302	6,170	315,549	18,615	17,011
Noble	17,140	477,681	5,509	103,111	12,509	9,932
Ottawa	4,469	132,911	1,343	36,682	4,488	5,580
Paulding	3,499	166,168	402	8,612	2,168	2,096
Perry	16,848	430,500	3,908	75,099	12,600	13,578
Pickaway	68,481	2,310,789	4,132	100,011	11,213	5,587
Pike	21,954	477,274	2,610	44,178	4,180	3,602
Portage	10,387	331,042	7,580	199,291	32,904	26,752
Preble	32,208	712,466	8,710	245,290	4,312	3,830
Putnam	16,211	488,406	2,104	45,568	6,626	6,189
Richland	20,400	580,081	15,606	410,552	17,098	17,630
Ross	61,434	1,818,199	3,442	66,772	9,915	4,849
Sandusky	16,997	440,406	7.117	207,096	9,313	9,975
Scioto	18,238	480,528	3,461	52,063	5,567	5,444
Seneca	26,113	613,095	11,991	309,934	15,381	14,282
Shelby	22,336	556,434	9,668	222,972	7,079	6,548
Stark	19,113	558,818	15,302	409,317	19,090	20,937
Summit	11,621	421,025	9,176	280,629	20,330	20,133
Trumbull	9,022	315,320	7,124	81,793	45,561	37,423
Tuscarawas	18,711	563,370	13,389	341,172	16,550	18,473
Union	23,344	773,304	2,957	67,757	14,406	14,220
Van Wert	10,329	282,609	1,092	27,611	4,827	4,894
Vinton	8,279	258,711	1,812	30,380	7,973	4,757
Warren	37,958	1,108,077	9,796	265,012	10,202	10,557
Washington	20,223	466,958	5,910	101,830	16,042	15,668
Wayne	23,592	618,713	18,033	481,521	23,911	36 358
Williams	10,402	336,075	4,550	91,615	6,793	5,846
Wood	17,548	557,060	5,239	167,279	12,230	13,304
Wyandot	17,864	586,253	3,286	91,519	14,723	14,916
Total	1,922,980	53,109,726	630,276	14,510,753	1,241,422	1,665,542

STATEMENT SHOWING THE CROPS, &c.—Continued.

COUNTIES.	CLOVER.				FLAX.			POTATOES.	
	Acres.	Tons.	Bush. of seed.	Acres plow'd	Acres.	Bush. of seed.	lbs. of fibre.	Acres.	Bush.
Adams	3,304	938	429	305	205	1,082	9,181	331	13,021
Allen	4,406	3,230	3,176	466	2,125	12,993	774	637	49,311
Ashland	7,962	6,370	5,339	38	1,336	8,549	26,421	1,116	98,709
Ashtabula	660	866	32	61	103	866	6,031	1,553	182,795
Athens	766	828	189	......	130	819	14,077	573	37,863
Auglaize	1,841	1,257	800	283	1,153	5,671	327	665	31,261
Belmont	4,595	3,502	139	84	104	608	5,809	831	68,865
Brown	4,111	540	69	448	93	449	7,320	628	31,149
Butler	5,732	1,516	150	1,883	725	5,145	1,016	986	62,031
Carroll	3,658	3,508	274	32	270	2,703	10,292	436	64,419
Champaign	3,880	2,574	1,428	476	680	3,848	7,054	602	59,360
Clark	3,366	2,864	787	345	1,038	6,258	37,884	809	56,132
Clermont	1,821	851	69	302	170	1,039	2,501	3,304	143,093
Clinton	1,453	575	11	563	621	5,134	971	558	35,612
Columbiana	8,928	7,561	585	53	887	5,600	17,540	1,014	117,460
Coshocton	1,769	1,750	249	85	109	712	6,634	728	75,196
Crawford	8,848	9,643	7,000	64	495	4,155	828	756	78,890
Cuyahoga	393	512	18	42	7	46	648	2,598	243,722
Darke	7,479	3,978	765	1,272	3,792	21,960	5,471	934	46,118
Defiance	3,021	2,621	675	342	307	1,631	12,662	643	45,915
Delaware	2,334	2,529	875	109	2,836	21,842	195,045	823	80,225
Erie	2,728	4,208	1,731	360	4	94	565	12,572	137,477
Fairfield	5,410	3,663	2,255	134	235	1,459	7,304	1,030	77,849
Fayette	391	297	36	65	227	2,162	1,027	223	46,006
Franklin	3,334	2,628	811	349	251	1,525	1,100	1,969	161,261
Fulton	4,989	4,674	3,419	424	68	515	2,391	726	81,991
Gallia	2,137	544	29	129	104	500	6,760	812	71,555
Geauga	137	168	......	......	210	1,679	6,171	1,008	123,539
Greene	5,825	2,859	350	1,045	2,159	16,453	79,360	956	66,201
Guernsey	1,755	1,379	1,055	12	204	1,302	12,280	725	44,128
Hamilton	2,990	2,474	19	461	7	48	483	4,642	203,162
Hancock	6,491	4,986	2,894	527	860	5,260	4,100	1,002	62,380
Hardin	2,128	1,869	840	81	546	4,390	1,309	568	48,036
Harrison	1,552	1,439	132	22	113	975	8,724	405	44,339
Henry	1,198	1,284	458	204	41	298	1,671	455	38,147
Highland	2,300	703	170	156	168	1,218	14,363	670	27,171
Hocking	2,213	826	337	168	304	1,823	8,939	476	30,887
Holmes	9,000	4,720	1,725	1,010	291	1,950	14,395	670	64,239
Huron	6,167	6,107	4,523	288	169	1,392	472	285	142,725
Jackson	598	207	63	74	147	858	9,649	377	21,833
Jefferson	4,030	4,207	188	68	63	643	6,047	569	52,754
Knox	2,940	2,720	1,310	76	1,245	5,010	133	1,045	97,002
Lake	932	1,240	100	47	38	244	1,773	2,175	276,827
Lawrence	2,714	543	70	173	135	613	9,282	544	28,309
Licking	2,070	1,857	353	......	195	1,113	4,367	1,141	116,163
Logan	4,463	3,271	1,634	376	1,585	9,511	9,941	527	47,463
Lorain	1,020	1,236	584	28	70	593	7,799	1,247	110,822
Lucas	2,391	2,672	1,681	160	49	616	6,899	1,213	115,513
Madison	547	363	9	12	99	645	....	347	23,450
Mahoning	4,913	5,141	1,535	53	2,070	13,699	165,117	1,132	131,533
Marion	5,132	4,726	3,318	75	620	4,084	6,158	613	55,198
Medina	3,412	3,396	2,761	6	1,125	7,956	14,522	1,056	116,559
Meigs	657	336	27	235	101	628	9,548	833	48,215
Mercer	4,151	3,112	1,403	502	2,816	17,179	2,205	643	42,290
Miami	6,723	3,342	1,026	1,166	2,871	18,521	121,261	739	58,196

STATEMENT SHOWING THE CROPS, &c.—Continued.

COUNTIES.	CLOVER.				FLAX.			POTATOES.	
	Acres.	Tons.	Bush. of seed.	Acres plow'd	Acres.	Bush. of seed.	lbs. of fibre.	Acres.	Bush.
Monroe	2,611	1,336	66	68	187	1,187	13,291	705	46,409
Montgomery	16,856	5,684	812	2,203	2,629	20,189	145,443	1,329	65,942
Morgan	2,080	1,819	220	119	121	840	8,029	519	39,312
Morrow	3,369	3,093	3,131	63	2,909	16,505	72,542	664	77,870
Muskingum	2,933	2,683	267	61	163	1,073	8,290	1,164	91,762
Noble	2,562	1,498	82	128	136	754	9,844	423	28,118
Ottawa	1,385	1,761	736	70	5	67	50	405	27,744
Paulding	908	462	53	36	60	965	492	211	17,098
Perry	1,650	1,460	354	96	294	1,729	20,316	698	39,475
Pickaway	3,043	752	478	135	73	634	694	555	40,653
Pike	785	173	47	164	144	686	9,116	373	17,847
Portage	2,617	2,372	805	36	1,047	15,071	125,186	1,991	196,377
Preble	10,210	1,726	280	3,108	3,857	28,094	603	486	32,726
Putnam	2,055	1,799	1,604	54	655	4,195	1,709	638	36,100
Richland	11,594	9,434	6,863	292	1,848	9,141	12,423	1,116	168,863
Ross	5,079	569	61	191	53	324	4,917	575	37,530
Sandusky	6,811	6,605	4,559	251	61	674	5,633	1,957	99,288
Scioto	639	282	177	111	101	557	8,420	944	32,737
Seneca	15,282	10,848	7,266	1,122	119	1,113	1,110	1,069	119,709
Shelby	3,077	1,602	659	452	1,588	10,366	4,000	536	41,930
Stark	15,690	15,379	2,639	649	799	5,280	98,033	1,400	161,855
Summit	5,505	4,912	1,711	139	210	1,512	93,586	1,181	129,293
Trumbull	777	9,671	122	128	1,234	8,131	264,340	1,430	145,238
Tuscarawas	7,483	7,156	893	186	628	5,001	13,200	932	94,414
Union	2,119	1,930	272	76	538	2,679	239	523	49,671
Van Wert	2,758	2,743	991	80	2,808	17,279	2,242	466	32,823
Vinton	290	103	26	12	144	825	9,776	327	20,427
Warren	2,254	1,193	231	439	824	6,173	12,444	760	58,140
Washington	2,722	1,918	159	230	199	1,090	15,843	1,452	140,079
Wayne	10,846	9,766	3,793	118	1,161	7,936	6,660	1,179	118,222
Williams	7,046	6,269	1,195	311	186	1,291	473	573	57,056
Wood	4,216	4,526	2,742	369	381	2,749	9,188	865	86,119
Wyandot	4,407	4,275	2,412	270	115	923	1,199	591	59,153
Total	349,425	266,958	105,620	27,508	61,661	411,102	1,890,032	91,961	6,776,418

STATEMENT OF THE CROPS, &c.—Continued.

COUNTIES.	TOBACCO.		BUTTER.	CHEESE.	STONE COAL.	PIG IRON.	SORGHUM.		
	Acres.	Pounds.	Pounds.	Pounds.	Bushels mined.	Tons manufactured.	Acres.	Pounds of sugar.	Gallons.
Adams	91	55,909	193,723	2,701	....	......	507	......	22,599
Allen	19½	8,007	248,859	12,273	....	......	359	73	31,089
Ashland	7	3,723	538,840	131,553	....	......	188	205	11,836
Ashtabula	170	204,730	906,845	2 605,526	....	......	63	......	5,812
Athens	294	301,423	290,447	26,180	3,605,530	......	436	......	50,536
Anglaize	21⅝	14,885	140,929	915	....	......	213	200	17,299
Belmont	1,430	1,449,089	467,038	7,526	1,257,072	2,852	707	113	87,222
Brown	2,142	1,822,755	137,119	4,847	....	......	642	32	42,472
Butler	291	222,869	346.990	953	....	......	283	78	34,483
Carroll	4	1,190	246,459	720	118,810	2,000	180	2,856	5,484
Champa'gn	54	42,956	337,832	33,458	....	......	219	......	20,795
Clarke	24¼	17,355	265,904	8,731	....	......	295	39	29,976
Clermont	409	268,394	288,382	477	....	......	522	478	35,421
Clinton	66	44,555	268,029	13,859	....	......	508	......	48,352
Columb'na.	10	2,670	425,728	22,415	1,281,035	......	150	312	12,638
Coshocton	11⅘	5,816	394,053	2,970	432,504	......	588	3,919	53,035
Crawford	8¼	6,520	359,556	1,139	....	......	127	101	12,120
Cuyahoga	6	4,497	652,133	939,262	....	......	85	171	10,905
Darke	534⅛	357,670	358,685	3,182	....	......	571	......	36,094
Defiance	197	158,900	220,484	11,043	....	......	243	......	21,790
Delaware	6	5,075	412,009	8,249	....	......	252	540	25,569
Erie	43	114,580	358,819	31,095	....	......	313	23	40,720
Fairfield	39	28,012	443,182	4,864	....	......	652	181	56,846
Fayette	11⅓	2,270	190.943	3,137	....	......	324	513	31,206
Franklin	28	10,940	334,385	5,780	....	......	706	259	51,898
Fulton	13 5-16	12,235	331,744	24,449	....	......	191	......	17,865
Gallia	81	34,351	190,881	12,197	50,110	1,400	530	......	50,788
Geauga	1	1,170	513,358	4,240,11	....	......	......	......	....
Greene	313	274,202	256,076	25,132	....	......	383	609	27,922
Guernsey	682	667,021	381,511	6,144	294,710	......	761	45	79,712
Hamilton	24⅞	16,450	292,839	3,755	....	......	246	126	19,052
Hancock	1½	380	423,155	13,235	....	......	201	468	13,715
Hardin	21	9,717	165,716	2,090	....	......	142	226	15,294
Harrison	42	10,816	347,679	3,260	304,713	......	368	44	38,606
Henry	17⅘	9,430	157,686	750	....	......	153	20	13,193
Highland	99½	63,733	366,681	4,577	....	......	684	273	62,104
Hocking	154	37,449	186,633	1,720	704,380	800	457	......	48,353
Holmes	2	900	376,415	11,180	147,900	......	305	1,695	20,616
Huron	59	56,303	679,015	76,772	....	......	313	1,663	37,134
Jackson	15	4,011	169,573	10.981	151,159	16,528	474	441	35,490
Jefferson	5⅘	3,441	280,727	7,396	2,281,679	......	296	27	29,675
Knox	43	33,857	412,349	13,440	....	......	253	84	17,942
Lake	69½	68,477	276,384	172,283	....	......	86	220	11,193
Lawrence	144	64,696	126,931	1,350	2,006,998	16,400	524	22	41,374
Licking	14	7,820	534,062	39,285	....	......	625	46	54,061
Logan	10	7,857	358,461	1,975	....	......	193	47	18,159
Lorain	54	51,101	780,358	978,592	....	420	321	173	42,563
Lucas	8	9,000	187,014	18,792	....	......	112	473	13,213
Madison	4	1,306	150,859	27,654	....	......	171	322	15,763
Mahoning	⅘	325	448,425	68,807	2,192,345	......	15	244	1,891
Marion	13⅝	7,380	255,869	1,947	....	......	132	15	12,634
Medina	22	19,244	757,386	491,330	....	......	47	108	5,033
Meigs	23	20,163	234,241	25,471	6,679,108	......	486	......	44,555
Mercer	23	1,127	175,177	2,685	....	......	322	......	26,806
Miami	722	269,205	338,793	2,213	....	......	716	279	45,945

STATEMENT OF THE CROPS, &c.—Continued.

COUNTIES.	TOBACCO.		BUTTER.	CHEESE.	STONE COAL.	PIG IRON.	SORGHUM.		
	Acres.	Pounds.	Pounds.	Pounds.	Bushels mined.	Tons manufactured.	Acres.	Pounds of sugar.	Gallons.
Monroe ...	2,338	1,834,789	250,642	66,806	15,033	......	594	50	51,754
Montgom'y	3,551	2,503,618	372,440	860	....	......	377	1,290	28,452
Morgan ...	839	1,026,617	657,568	11,607	112,916	......	620	28	73,790
Morrow ...	8	3,667	413,017	6,619	....	......	167	33	175,27
Musking'm	32	12,177	457,420	4,641	1,559,203	974	858	18	92,157
Noble	2,739	2,393,370	320,181	15,642	198,371	......	683	60	64,955
Ottawa ...	6	2,401	78,323	3,250	....	......	58	5,862	7,000
Paulding..	7	2,240	52,854	500	....	......	68	129	3,504
Perry	187	154,380	414,840	3,950	262,986	......	507	532	43,030
Pickaway .	13	10,120	246,225	2,376	....	......	406	......	42,807
Pike	53	26,177	87,318	638	....	......	353	180	26,935
Portage ...	10	9,104	726,966	2,237,556	....	......	42	642	3,665
Preble	535	400,267	379,580	1,574	....	......	456	106	49,550
Putnam...	9	4,945	2,149,137	1,146	....	......	229	......	19,540
Richland ..	12	11,360	551,557	8,961	....	......	107	30	13,557
Ross	44	19,703	218,939	8,123	....	......	535	164	53,928
Sandusky .	13	3,360	264,389	1,996	110	......	421	......	35,780
Scioto......	18	5,040	116,418	24	5,110	2,550	314	1,042	5,477
Seneca.....	13	12,085	492,589	5,031	....	......	323	......	2,911
Shelby	284	196,701	227,255	300	....	......	279	130	22,185
Stark......	121	99,846	666,095	13,998	1,242,897	8,864	142	......	11,734
Summit...	16	23,045	603,430	1,407,616	238,816	......	82	574	7,838
Trumbull.	11	7,723	766,773	3,802,086	13,298,665	5,859	4	......	456
Tuscaraw's	33	18,514	496,036	66,210	569,369	......	467	......	45,920
Union	6	4,484	279,559	65,391	....	......	138	34	12,055
Van Wert.	27	49,847	170,964	815	....	......	173	......	13,039
Vinton....	52	41,992	114,620	2,080	130,756	4,391	323	......	26,520
Warren ...	860	335,944	276,661	4,486	....	......	472	834	29,937
Washi'gt'n	693	659,960	432,743	30,446	66,667	......	874	481	80,630
Wayne....	37	32,156	675,383	28,306	947,249	......	149	706	9,301
Williams..	6	5,325	409,182	4,005	....	......	83	20	6,231
Wood.....	33	5,476	270,033	18,352	....	......	321	76	42,094
Wyandot..	9	5,548	217,114	6,662	....	......	124	876	8,678
Total ...	31,220	16,839,938	32,841,635	61,558,481	40,157,091	63,038	29,392	41,660	2,609,728

STATEMENT OF THE CROPS, &c.—Continued.

COUNTIES.	MAPLE SUGAR.		DOGS.	SHEEP KILLED.		SHEEP INJURED.		Aggregate value of sheep killed and wounded.
	Pounds.	Syrup.	Number.	Number.	Value.	Number.	Estimate of injury done.	
Adams	12,241	2,091	2,650	337	$1,289 00	173	$405 00	$1,694 00
Allen	48,185	1,086	1,727	201	775 00	161	473 00	1,248 00
Ashland	142,697	6,168	2,938	171	715 50	61	320 00	1,035 50
Ashtabula	171,058	1,353	480	237	930 00	220	274 00	1,204 00
Athens	17,299	2,324	1,616	424	1,551 00	133	317 00	1,868 00
Auglaize	28,374	755	1,589	295	750 00	92	85 00	835 00
Belmont	8,944	3,245	2,893	593	2,976 00	573	1,606 00	4,582 00
Brown	8,049	1,778	2,291	518	2,373 00	170	277 00	2,650 00
Butler	21,381	23,105	2,735	184	1,053 00	117	336 00	1,389 00
Carroll	2,905	729	1,188	119	559 00	155	438 00	997 00
Champaign	88,745	4,990	1,960	540	2,799 00	954	2,399 00	5,198 00
Clarke	10,024	1,164	2,196	404	2,089 00	223	652 00	2,741 00
Clermont	3,668	2,903	2,233	450	5,232 00	166	427 00	2,659 00
Clinton	106,758	3,037	2,470	427	2,083 00	313	544 00	2,627 00
Columbiana	46,639	5,166	2,099	272	1,272 50	375	463 00	1,735 50
Coshocton	11,023	1,571	2,569	584	2,871 00	222	536 00	3,407 00
Crawford	53,855	1,887	2,125	233	694 00	140	202 00	896 00
Cuyahoga	109,866	1,167	3,340	322	1,472 00	149	265 00	1,737 00
Darke	60,044	8,006	3,564	407	1,424 50	216	415 50	1,840 00
Defiance	34,378	970	1,179	236	777 00	60	100 00	877 00
Delaware	94,844	4,873	1,939	321	1,620 00	366	1,114 00	2,734 00
Erie	13,961	177	956	267	1,319 00	160	329 00	1,648 00
Fairfield	49,155	3,759	3,546	465	2,002 00	733	780 00	2,782 00
Fayette	9,326	1,126	1,894	612	2,552 00	264	809 00	3,361 00
Franklin	18,767	1,513	2,634	463	2,541 75	734	1,241 00	3,782 00
Fulton	18,020	909	1,267	265	1,112 00	230	277 00	1,389 00
Gallia	6,538	406	2,010	573	1,631 00	74	139 00	1,770 00
Geauga	411,609	1,319	767	489	468 00	34	151 00	619 00
Greene	56,300	15,684	2,641	621	3,055 00	586	1,261 00	4,259 00
Guernsey	2,830	345	2,046	363	1,417 00	366	875 00	2,292 00
Hamilton	1,429	2,811	2,954	184	1,005 00	143	670 00	1,675 00
Hancock	111,707	3,382	2,154	256	933 00	201	407 00	1,340 00
Hardin	72,991	2,213	1,673	425	2,173 00	149	315 00	2,488 00
Harrison	6,299	1,428	1,440	198	895 00	222	564 00	1,459 00
Henry	12,035	1,270	827	76	312 00	10	29 00	341 00
Highland	38,124	3,069	3,027	542	2,368 00	292	555 00	2,908 00
Hocking	6,564	448	1,868	298	1,101 00	107	285 00	1,386 00
Holmes	21,260	1,163	1,199	80	303 00	53	133 00	436 00
Huron	103,630	2,195	2,105	342	1,498 00	246	565 00	2,063 00
Jackson	2,748	265	1,983	381	1,209 00	112	145 00	1,354 00
Jefferson	4,890	2,078	1,569	346	1,686 00	162	391 00	2,077 77
Knox	102,913	5,085	1,917	238	951 00	182	662 00	1,613 00
Lake	68,568	1,634	449	249	922 00	198	385 00	1,307 00
Lawrence	2,081	150	2,287	416	1,209 50	98	188 00	1,397 50
Licking	80,809	4,982	2,728	387	1,820 00	896	1,684 00	3,504 00
Logan	296,463	4,875	2,361	357	1,688 00	223	579 00	2,267 00
Lorain	130,958	2,301	1,402	464	1,924 00	122	442 00	2,366 00
Lucas	2,500	59	1,090	230	945 00	149	258 00	1,203 00
Madison	3,685	125	1,384	494	2,147 00	188	700 00	2,84700
Mahoning	117,400	10,053	1,933	298	1,414 00	427	986 00	2,400 00
Marion	31,267	543	1,496	266	1,254 00	173	467 00	1,721 00
Medina	249,628	5,945	1,717	98	400 00	260	260 00	660 00
Meigs	7,682	251	2,165	403	1,290 00	96	191 00	1,481 00
Mercer	22,658	1,217	2,123	207	622 00	58	154 00	776 00

STATEMENT OF THE CROPS, &c.—Continued.

COUNTIES.	MAPLE SUGAR.		DOGS.	SHEEP KILLED.		SHEEP INJURED.		Aggregate value of sheep killed and wounded.
	Pounds	Syrup.	Number.	Number.	Value.	Number.	Estimate of injury done.	
Miami	67,603	10,916	2,494	409	$1,535 00	117	$355 00	$1,890 00
Monroe	4,452	123	2,727	392	1,345 00	107	211 00	1,556 00
Montgomery	124,039	13,574	3,676	306	1,557 00	71	167 00	1,724 00
Morgan	5,537	712	1,906	286	1,409 00	492	447 00	1,856 00
Morrow	77,476	2,778	1,090	222	864 00	177	349 00	1,213 00
Muskingum	4,460	750	4,642	549	2,477 00	350	816 00	3,293 00
Noble	3,819	196	2,949	396	1,543 00	96	234 00	1,777 00
Ottawa	5,006	1,900	557	259	635 00	210	131 00	766 00
Paulding	12,335	791	777	64	300 00	9	19 00	319 00
Perry	39,890	2,931	2,065	336	1,404 00	207	520 00	1,924 00
Pickaway	15,304	1,666	3,137	578	2,432 00	450	794 00	3,226 00
Pike	14,233	710	1,954	235	845 00	58	140 50	985 50
Portage	355,893	8,422	1,245	249	1,011 00	227	404 00	1,415 00
Preble	62,452	11,330	2,603	366	1,652 00	188	414 00	2,066 00
Putnam	63,479	1,078	1,637	139	555 00	125	289 00	844 00
Richland	118,960	8,021	2,890	305	1,587 00	298	877 00	2,464 00
Ross	28,715	4,919	3,161	804	3,977 00	594	726 00	4,703 00
Sandusky	19,962	683	1,727	152	637 00	87	293 00	930 00
Scioto	3,569	417	1,568	390	1,051 00	43	70 00	1,121 00
Seneca	75,940	2,877	2,410	433	1,678 00	345	635 00	2,313 00
Shelby	30,813	2,532	1,983	296	1,570 00	212	681 00	2,251 00
Stark	60,488	4,782	3,288	575	2,596 00	618	939 00	3,535 00
Summit	79,396	2,123	1,300	253	1,089 00	127	314 00	1,403 00
Trumbull	193,771	7,567	1,964	412	1,961 00	355	710 00	2,671 00
Tuscarawas	16,068	1,390	2,793	553	2,486 00	253	631 00	3,117 00
Union	142,573	2,686	1,651	264	1,222 50	112	284 00	1,506 50
Van Wert	23,853	954	1,283	95	259 00	60	95 00	354 00
Vinton	6,862	322	1,300	488	1,580 50	155	303 00	1,883 50
Warren	162,862	10,725	1,389	384	2,051 00	146	403 00	2,154 00
Washington	4,370	956	3,324	753	2,591 00	725	942 00	3,533 00
Wayne	73,300	4,677	2,294	363	1,631 00	315	536 00	2,167 00
Williams	86,706	3,122	1,340	177	676 00	148	298 00	974 00
Wood	33,062	2,077	1,296	294	839 00	133	323 00	1,162 00
Wyandot	27,453	1,351	1,343	482	2,251 00	457	1,150 00	3,401 00
Total	3,307,303	281,116	173,712	30,716	139,069 75	21,032	44,686 00	174,685 50

PROCEEDINGS OF THE BOARD.

STATE AGRICULTURAL ROOMS, Jan. 5, 1864.

Members all present except Mr. Putnam.

Board met and proceeded to organize for the year 1864, by ballot, with the following result: For President, Nelson J. Turney, of Circleville.

On motion, the rules were suspended, and David Taylor, of Columbus, was elected Treasurer; William F. Greer, of Painesville, Recording Secretary; and John H. Klippart, Corresponding Secretary.

On motion, adjourned.

D. McMILLAN,
Rec. Secretary.

JANUARY 6, 1864.

Members all present.

On motion of Mr. Gardner, the Treasurer was instructed to invest $7,000 in U. S. Five-Twenties.

On motion of Mr. McMillan, it was

Resolved, That this Board have four regular meetings each year.

The President then appointed the following members as Executive Committee: T. C. Jones, David Taylor, and Daniel McMillan.

On motion of Mr. Gardner, the Executive Committee was authorized to purchase from Mr. Klippart such books as they may think expedient for the Library of the Board.

On motion of D. McMillan, it was

Resolved, That the next State Fair be held on September 13 to 16, inclusive.

On motion, adjourned to meet at the call of the President.

accordance with instructions from the Board, the Executive Commit- e selected the following books offered for sale by John H. Klippart, viz:

1 vol.	Loudon's Encyclopedia of Agriculture	$12
6 "	" Arboretum et Fruiticum	26
6 "	American Agriculturist	7.
2 "	Morton's Encyclopedia of Agriculture	20.

24 vols.	Journal of Royal Agricultural Society	$120
4 "	" Bath and West of England Society	16
11 "	Highland and Scotland Agricultural Journal and Transactions	40
1 "	Stonehenge on the Horse	6
1 "	Austrian Cattle	15
56		$262

AGRICULTURAL ROOMS, Jan. 28, 1864.

The Executive Committee met in pursuance of a call of the President.

On motion, it was ordered that the Corresponding Secretary address a letter to John Reber, inquiring the price, condition, and where a copy of the American Turf Register or Stud-Book can be purchased.

On motion, ordered that the Corresponding Secretary address a letter to Norton S. Townshend, at present Medical Director in the U. S. Army, soliciting him to write his experience in relation to the hardiness and prolificacy of the Leicester sheep in Ohio, for publication in the forthcoming Report.

On motion, ordered that the Corresponding Secretary present the original bills for approval to the Treasurer, before a draft is drawn for the same, so far as office expenses are concerned.

On motion, ordered that the Treasurer pay J. H. Klippart two hundred and sixty-two dollars for books, as per bill rendered.

On motion, ordered that the Corresponding Secretary subscribe for the *Ohio Farmer*, *Country Gentleman*, and *American Agriculturist.*

On motion, ordered that the claim of Jefferson Patterson, deceased, for lumber furnished at Dayton Fair, be allowed, and the Corresponding Secretary send a draft on the Treasurer for the amount to the widow of Mr. Patterson.

On motion, ordered that the Corresponding Secretary prepare a plan of an agricultural survey of Franklin county, to be submitted to the Board at its next meeting.

On motion, ordered that an album be purchased, to preserve the photographs of the members of the Board; and further ordered, that the Corresponding Secretary issue a circular letter to all members and ex-members of the Board, soliciting their photographs, to be preserved among the archives of the Board.

On motion, the bond of Theodore Comstock and others, guaranteeing the payment of $5,000 as an inducement to hold the Fair in Columbus in September, 1864, was accepted.

On motion, ordered that the Corresponding Secretary issue a circular to the secretaries of the several county societies, requesting them to forward names of proper and competent persons to be appointed as committeemen on the several classes of articles on exhibition at the ensuing State Fair.

On motion, ordered that the Corresponding Secretary receive sealed proposals for the following printing, viz: 7,000 premium lists, not to exceed 32 pages; 10,000 ditto; 12,000 ditto; 1,000 3-sheet 2-color posters; 1,500 ditto; 2,000 ditto; 3,000 ditto; 500 complimentary tickets; 2,500 entry tickets, 30 to 40 changes; 24 large Department cards; 200 ½-sheet posters; 1,000 first premium tickets, red; 1,000 second premium tickets, blue; 500 certificates for return freight.

The Committee, on invitation of the citizens, visited Stewart's Grove, south of Columbus; the Olentangy Horse Park Grounds, north of Columbus; and the County Fair Grounds, east of Columbus.

At the evening session, it was

Resolved, That the Fair for 1864 be held in Stewart's Grove, and the adjoining lands of Mr. Jaeger.

On motion, the Committee adjourned to meet in full Board on Monday, April 25, 1864.

STATE AGRICULTURAL ROOMS,
Columbus O. Jan. 28, 1864.

JOHN REBER, ESQ.: DEAR SIR.—I have been requested by our Ex. Com. to inquire of you if you know where we can purchase a complete copy, or a copy as nearly complete as may be, of the American Turf Register, or American Stud Book. How much will it cost, and is it bound or unbound? It is a book of reference which is indispensably necessary for the correct awards at our fairs, and the introduction of the many "blooded" horses from the South during the past few years embarrasses the committees at the fairs more and more every year. Your early reply will be thankfully received.

Respectfully,
Yours truly,
JOHN H. KLIPPART, *Cor. Sec'y.*

Mr. Reber replied that he did not know where a copy could be purchased—that Mr. James Buckingham was in the possession of a copy which he possibly might be induced to loan, or else appoint Mr. Buckingham on the committee of thorough-bred horses, and thus the information would be substantially at the command of the Board.

STATE AGRICULTURAL ROOMS,
Columbus, O. Feb. 6, 1864.

NORTON S. TOWNSHEND, Esq: DEAR SIR.—At a meeting of the Executive Committee on the 28th ult., it was *ordered* that the Cor. Sec'y address a letter to N. S. Townshend requesting him to write out for publication, in the Ohio Agricultural Report for 1863, his views, observations and experiences with Leicester sheep, especially with relation to their hardiness and prolificacy in Ohio.

It appears that Hon Henry S. Randall and some other writers are of opinion that the Leicesters are not hardy and that they are not prolific. Mr. T. C. Jones who is somewhat interested in Leicesters is satisfied that they are as hardy and as prolific as any other sheep in the State.

Respectfully,
Yours truly,
JOHN H. KLIPPART, *Cor. Sec'y.*

Mr. Townshend replied, verbally, that he would be pleased to conform to the desires of the Board in relation to the Leicester sheep, but feared he would be unable to do so as long as the rebellion continued.

STATE AGRICULTUAL ROOMS,
April 25*th*, 1864.

Members all present, and proceeded to revise the premium list.

The premium list, rules and regulations, as adopted for 1864, were as follows, viz:

PRICES OF ADMISSION.

Any person paying One Dollar may enter as many different articles for exhibition as he or she may own, in any of the departments except Horses, Cattle and Sheep; in these the entrance fee will be One Dollar for the first entry, and Fifty Cents for each additional entry—five Ewes or Lambs to be regarded as one entry.

Animals competing in the class of Sweepstakes will be charged an entrance fee of Five Dollars in each class.

Each exhibiter will be furnished with admission tickets at the rate of twenty-five cents each for the amount of entry fees paid by him, except in Sweepstakes.

No Exhibiter's Tickets will be issued.

Each member of the awarding committees will be furnished with a badge, upon the proper registry of name with the clerk set apart for that object, whose location at the office will be designated by a sign.

Single tickets, 25 cents.

No carriages, or persons on horseback, admitted on the grounds.

RULES AND REGULATIONS APPLICABLE TO ANIMALS.

I. Entries *must* specify the exhibiter's name, and the *name* and age of the animal offered.

No animal to be entered in the name of any other than the *bona fide* owner. Should any be entered otherwise, they will not be allowed to receive a premium although awarded by the Judges.

An animal entered for exhibition in one class, cannot compete for a premium in any other, except as follows:

A single animal may be exibited as one of a pair or herd.

Each horse will have the ring for trial *separately*, to the satisfaction of the awarding committee.

Exhibiters are required to have their articles entered on the books, at the business office, before they are placed within the inclosure. On the entry of the articles or animals, cards will be furnished, with the number and class, as entered at the office, which are to be placed on the animal or article to be exhibited, and no others will be admitted on the grounds.

Exhibiters must *see to the delivery* of their articles upon the grounds, and to the *Superintendent of the appropriate Department;* and the Society cannot, in any case, make provision for their transportation, or be subjected to any expense therefor, either in their delivery at or return from the grounds; but all expenses connected therewith must, as heretofore, be provided *by the exhibiter.*

II. Persons intending to exhibit thoroughbred animals in the subdivision of Cattle and Horses, will be required to furnish a Pedigree of the animals to be exhibited; the pedigrees to be delivered to the Secretary at the time of making the entry.

III. The standard authority in all cases of pedigree of Cattle, shall be the English and American Herd books; and for Horses, the English Stud Book, and the American Turf Register.

No Premium will be awarded to any aged animal which has received the first Premium in the same class at former State Exhibitions, either of this or any other State; *provided*, always, that all may com pete for Sweepstakes.

Evidence will be required that animals exhibited as *Breeders* are not barren. Breeding Cows must have produced a living calf within the two years last past.

No person other than the Judges will be permitted to go into the ring where stock is exhibited, except the officers of the Society or Marshals.

No stock will be permitted to enter the ring unless under halter, and in the care of a groom.

Animals will be exhibited in the ring, prepared for the purpose, and the premium ribbons attached by the Judges before leaving the inclosure. *First Premium*—RED. *Second Premium*—BLUE.

No article shall be removed before the close of the exhibition, without the permission of the President of the State Board. Every exhibiter should have his articles on the grounds, and arranged in their places by Tuesday, and if delayed beyond 12 o'clock M. of that day, *they cannot come in competition for premiums.*

The State Board will take every precaution in their power for the safe preservation of stock and articles on exhibition, *after* their arrival and arrangement upon the grounds, but will not be responsible for any loss or damage that may occur. Exhibiters are desired to give attention to their articles, and at the close of the Fair to attend to their removal.

FORAGE FOR STOCK.

For the convenience of exhibiters, hay and straw will be supplied upon the grounds without charge; provided that if horses are entered for competition, and not exhibited in the ring in the class in which they were entered, they shall be charged at the rate of *One Dollar* per day.

Arrangements have been made with a responsible party to furnish oats and corn on the grounds at market prices, in quantities to suit purchasers.

GENERAL INSTRUCTIONS TO JUDGES.

The Judges are required to report themselves at the office of the Secretary, on the grounds, where an appropriate insignia will be furnished to them.

Vacancies will be filled at the office of the State Board, on Wednesday, at 10 o'clock A. M., when the books of entries, together with the requisite number of Premium cards, will be delivered.

No person who is an exhibiter can act as Judge on the class in which he exhibits.

When articles or animals are not deemed worthy of a Premium, the Judges will refuse to award a Premium.

No person will be allowed to interfere with the Judges during their adjudications; and any person who, by letter or otherwise, attempts to interfere with the Judges, will be excluded from competition.

The Judges will report the animals entitled to premiums only. Any animals, which, in the opinion of the Judges, deserve a special commendation, will be so reported.

Purity of blood, as established by pedigree, symmetry, size, early maturity, and general characteristics of the several breeds of animals, to be considered; and the Judges will make proper allowance for age, feeding and other circumstances. Identity of color is not indispensable to Matched Horses.

The Judges on Stock, if not satisfied as to the regularity of the entries in their re spective classes, will apply to the Secretary for information; and should there be any doubts, after the examination, of their coming within the regulations, or if any animal is of such a character as not to be entitled to exhibition in competition, they will report the fact to the State Board, that such course may be adopted as the case may require.

The Judges on Fat Cattle will give particular attention to animals submitted for examination. It is believed that, all other things being equal, those are the best cattle that have the greatest weight in the smallest superfices. The Judges will require all the cattle in this class to be weighed, and will take measures to give the superfices of each in their reports. *They will also (before awarding any premiums) require of the competitors full statements as to the manner and cost of feeding.*

REPORTS.

The Judges will be expected to give the *reasons for their decisions*, embracing the valuable and desirable qualities of the animals or articles to which premiums are awarded. And, as one great object of the Society is to collect valuable information upon subjects connected with Agriculture, the several awarding committees are requested to gather all the information possible from exhibiters, in their respective departments, and make their report as full as circumstances will permit.

They will make their reports of awards to the Corresponding Secretary, at the business office as early as possible, but in no case later than the third day of the Fair.

A copy of the entry-book will be given to the chairman of the committee, so that he may write out a full report, embracing the reasons upon which the awards were made, which shall be forwarded to the Corresponding Secretary within thirty days from the close of the Fair.

DISCRETIONARY PREMIUMS.

No awarding committees shall award any discretionary premiums. Whenever articles of superior merit are exhibited, for which no premiums have been offered, the awarding committee may enter the same on the book of the awards, so that the Secretary may report the same to the Board for further action.

AWARDING COMMITTEES MUST NOT ATTACH PREMIUM CARDS TO ARTICLES FOR WHICH NO PREMIUMS ARE OFFERED.

PAYMENT OF PREMIUMS.

Premiums are payable in cash if desired, except where medals or diplomas are specified. The diplomas and medals will be delivered at the State Agricultural Rooms, in the State House in Columbus, as soon as they can be prepared or engraved, or will be forwarded as directed, to the proper persons by the Secretary.

Premiums will be paid by the Treasurer, only on the order of the President and Secretary, and will be delivered by the Secretary, on application, at any time after the Fair. These orders must be indorsed by the party to whom they are made payable.

All premiums awarded must be claimed within twelve months from the time of award, or they will be deemed forfeited.

STATEMENTS TO BE FURNISHED BY APPLICANTS FOR PREMIUMS ON FARM CROPS.

1. The land shall be measured by some competent person, who shall make affidavit of the accuracy of the measurement, and the quantity of ground.

2. The applicant shall make affidavit according to the forms annexed, to the quantity of grain raised on the ground, entered on the premium list, which affidavit must accompany the application for premiums, together with a sample of the grain.

The main object of the Society being to promote profitable cultivation, they do not propose to offer premiums for crops produced by extravagant expenditure; therefore a detailed, certified account of the expenses of cultivation must be made. The expense of labor and manure should be particularly stated, and the kind of manure used. The statement must be in the following form:

To —— loads manure, at $—— per load........................ $————
To —— days' plowing, at $—— per day .... $————
To —— “ labor, at $—— “ .... $————
To —— “ harvesting, $—— “ .... $————
To —— “ marketing.. $————

And thus each item of expense incurred in the cultivation and marketing of the various crops, upon which premiums are applied for, must be fully stated.

The kind and condition of the soil; the quantity and kind of seed used; the time and mode of putting it in the ground, should be particularly stated.

Samples of grain and vegetables produced, to be exhibited at the State Fair where practicable, and also to be sent to the rooms of the Board at the January meeting.

3. All the grain grown on the entire piece of land measured, must be either all weighed or measured, *and not the product of a square rod or two weighed, and the remainder guessed at.*

FORMS OF AFFIDAVITS.

——— County, ss.

A. B., being duly sworn, says he accurately measured the land upon which C. D. raised a crop of —— the past season, and the quantity of land is —— acres, and no more.

Sworn to before me, this day —— day of ———, 186 .

——— ———, Justice.

——— County, ss.

C. D., being duly sworn, says that he raised a crop of —— the past season, upon the land measured by A. B., and that the quantity of grain raised thereon was —— bushels, and no more weighed (or measured in a sealed half bushel, as the case may be), and that the statements, in regard to the manner of cultivation, etc., are correct to the best of my knowledge.

C. D.

Sworn to before me, this —— day of ———, 186 .

——— ———, Justice.

LIST OF PREMIUMS.

FIRST DEPARTMENT.

CATTLE.

James Fullington, Attending Member of the Board.

1. *Thoroughbred Cattle.*

Best bull, 3 years old and upwards	$50
2d best “ “ “	30
Best bull, 2 years old and under 3	30
2d best “ “ “	20
Best bull, 1 year old and under 2	25
2d best “ “ “	15
Best bull calf	10
2d best “	5
Best cow, 3 years old and upwards	50
2d best “ “ “	30
Best cow, 2 years old and under 3	$30
2d best “ “ “	20
Best heifer, 1 year old and under 2	25
2d best “ “ “	15
Best heifer calf	10
2d best “	5

Awarding Committee.—Chas. Phillis, Rosedale, Madison Co., O.; Felix W. Renick, S. Bloomfield, Pickaway Co., O.; Wm. Warfield, Lexington, Ky.

2. *Work Oxen and Steers.*

Best yoke of oxen, 4 yrs old and upw'ds	$25
2d best “ “ “	15
Best “ 3 yrs old and under 4	15
2d best “ “ “	10
Best “ 2 yrs old and under 3	10
2d best “ “ “	5

Fat Cattle.

Best single bullock, 4 yrs old and up'ds	$30
2d best “ “ “	20
Best steer, 3 yrs old and under 4	20
2d best “ “	10
Best “ 2 yrs old and under 3	20
2d best “ “	10
Best cow or heifer	20
2d best “	10

Statement of manner of feeding to be handed to the Secretary at the time of entry.

Milch Cows.

Best milch cow of any breed	$25
2d best “ “	16

The cow to be kept on grass only during the experiment, and for fifteen days previous to each period of trial.

The exhibiter may commence the account of the yield of milk, and the quantity of butter produced at such time as may by him be deemed most proper, and be continued for ten successive days. Then after an interval of fifty days, to be resumed, and again continued ten days.

Statement to be furnished containing—

1st. The age, weight, and breed of cows, and time of calving.

2d. The quantity of milk in weight, and also of butter, during each period of ten days.

3d. The butter made to be exhibited with the cow, at the Fair; and the statement to be verified by the affidavit of the competitor and one other person conversant with the facts.

Awarding Committee.—David Seltzer, Midway, Madison Co.; John Enock, Sr., West Liberty, Champaign Co.; Elijah Bemis, Groton, Erie Co.; Erastus Spencer, Claridon, Geauga Co.; M. M. Munson, Granville Licking Co.

3. *Sweepstakes.*

Best herd of one bull and four cows, all to be of one breed and owned by exhibiter, a premium of	$100
2d best herd of one bull and four cows, all to be of one breed and owned by exhibiter, a premium of	50
Best breeding bull, to be exhibited with 5 of his calves not less than one year old, and the bull, as to constitution, health and vigor, to exhibit good breeding condition	50
2d best do	25
Best bull of any age or class	50
Best cow	50

Awarding Committee.—Alex. Waddle, South Charleston, Clark Co.; James M. Trimble, Hillsboro', Highland Co.; James Anderson, Chillicothe, Ross Co.; Anson P. Howard, Woodstock, Champaign Co.; Thos. S. O'Bannon, Newark, Licking Co.

HORSES.

T. C. JONES, Attending Member of the Board.

4. CLASS I.—*Thoroughbred.*

(No unsound animal to receive a premium in any class.)

Best stallion, 4 years old and over	$50
2d best “ “	25
Best stallion, 3 years old and under 4	25
2d best “ “	15
Best stallion, 2 years old and under 3	20
2d best “ “	10
Best stallion, 1 year old and under 2	$15
2d best “ “	10
Best sucking stallion colt	10
2d best “	5
Best brood mare, 4 years old and over	30
2d best “ “	20
Best brood mare, 3 yrs old and under 4	20
2d best “ “	15
Best brood mare, 2 yrs old and under 3	15
2d best “ “	

Best filly, 1 year old and under 2	$10
2d best " "	5
Best sucking mare colt	10
2d best "	5

☞ *No racing allowed upon the ground.*

☞ Each horse will have the ring for trial *separately*, to the satisfaction of the awarding committee.

☞ All mares over 4 years old, exhibited in Classes I., II., III. and IV., must have produced a live colt within the past two years.

Awarding Committee. — Chas. Anderson, Dayton, O.; Garrett Williamson, Hamilton, Butler Co.; Ed. Bennett, Woodstock, Champaign Co.; Daniel Harness, Chillicothe, Ross Co.; Jas. Buckingham, Zanesville, Ohio.

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5. CLASS II.—*Roadsters.*

TO BE SHOWN IN HARNESS.

Best stallion, 4 years old and over.....	$50
2d best " "	25
Best stallion, 3 years old and under 4 ..	25
2d best " "	15
Best stallion, 2 years old and under 3 ..	20
2d best " "	10
Best brood mare, over 4 years old	30
2d best " "	20
Best brood mare, 3 yrs old and under 4.	20
2d best " "	15
Best brood mare, 2 yrs old and under 3.	15
2d best " "	10

Trotters.

The standard of excellence in this class will be endurance, style and action, with correct form, rather than high speed for short distances.

Awarding Committee. — Stephen Eldred, Lebanon, O.; Walter C. Brown, Columbus, O.; Halbert M. Reid, Sydney, O.; George Caves, Morefield, Harrison Co., O.; Wm. B. Lewis, Marion, O.

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6. CLASS III.—*Horses for General Purposes.*

Best stallion, 4 years old and over.....	$50
2d best " "	25
Best stallion, 3 years old and under 4 ..	$25
2d best " "	15
Best stallion, 2 years old and under 3 ..	20
2d best " "	10
Best stallion, 1 year old and under 2 ...	15
2d best " "	10
Best sucking stallion colt.............	10
2d best "	5
Best brood mare, over 4 years old......	30
2d best " "	20
Best brood mare, 3 yrs old and under 4.	20
2d best " "	15
Best brood mare 2 y's old and under 3 ..	15
2d best " " " ..	10
Best filly, 1 year old and under 2.......	10
2d best " "	5
Best sucking mare colt	10
2d best " "	5

Awarding Committee.—John Reber, Lancaster, Fairfield Co.; Collins Morse, Painesville, Lake Co.; Jas. M. Kauffman, Bellefontaine, Logan Co.; Chas. Hook, Xenia, Greene Co.; Jas. D. Ladd, Richmond, Jefferson Co.

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7. CLASS IV.—*Draft Horses.*

Best stallion, 4 years old and over......	$50
2d Best " " "	25
Best " 3 years old and under 4..	25
2d best " " " ..	15
Best " 2 " " 3..	15
2d best " " " ..	10
Best " 1 year old and under 2..	10
2d best " " " ..	5
Best sucking stallion colt..............	10
2d best " "	5
Best brood mare under 4 years old......	30
2d best " " "	20
Best " 3 years old and under 4..	20
2d best " " " ..	15
Best " 2 " " 3..	15
2d best " " " ..	10
Best filly, 1 year old and under 2......	10
2d best " " " . ..	5
Best sucking mare colt...............	10
2d best " "	5

Awarding Committee.—Marcus Brown, Circleville, Pickaway Co.; John Sears, Litchfield, Medina Co.; Horatio J. Cox, Zanesville, O.; Joseph Wells, Delaware, O.; M Smithers, Troy, Miami, O.

8. CLASS V.—*Matched Horses and Mares.*

Best pair of coach horses	$20
2d best “ “	10
Best pair of farm or draft horses or mares.	20
2d best “ “ “	10
Best pair of matched roadsters	20
2d best “ “	10

To be exhibited in harness; a single horse may be exhibited as one of a pair.

Geldings and Mares for Harness, Saddles, etc.

TO BE EXHIBITED IN HARNESS.

Best gelding for light harness	20
2d best “ “	10
Best mare for light harness	20
2d best “ “	10

TO BE EXHIBITED UNDER SADDLE.

Best horse or gelding for saddle	20
2d best “ “	10
Best mare for saddle	20
2d best “	10
Best and fastest trotting stallion	20
Best and fastest trotting mare	20
Best and fastest trotting gelding	10

☞ Open to all horses that have not trotted for money.

SWEEPSTAKES OPEN TO ALL.

Best and fastest trotting horse, mare or gelding	20
Best and fastest pacing or racking horse, mare or gelding	20

Awarding Committee.—Jesse Linton, Wilmington, Clinton Co.; Joseph R. Van Metre, Catawba, Champaign Co.; Miner Andrews, Tallmadge, Summit Co.; Geo. W. Williams, Columbus, O.; Frank Dunlevy, Newark, Licking Co.

9. CLASS VI.—*Sweepstakes on Horses.*

Best stallion of any age or breed	$50
Best mare “ “	50

SWEEPSTAKES FOR COLTS.

Best 5 colts, not less than one year old, sired by any one horse, and the sire to be exhibited with his colts; style, size, and action to be specially considered	40
2d best “ “	20
To the sire of the best five colts, as above specified	silv. med
2d best five colts, as above specified	“

Awarding Committee.—John M. Millikin, Hamilton, Butler Co.; H. H. Manahan, Norwalk, Huron Co.; Charles Fullington, Milford Centre, Union Co.; Joseph Cellars, Carrollton, Carroll Co.; A. V. Applegate, Lancaster, Fairfield Co.

10. CLASS VII.—*Jacks and Mules.*

Best jack, 3 years old and over	$25
“ 2 years old and under 3	15
“ 1 year old and under 2	5
Best jennet, 3 years and over	15
“ 2 years and under 3	10
“ 1 year and under 2	5
Best pair of mules, 2 years old and over.	10
Best pair of mule colts	5

Awarding Committee.—Isaac S. Wilson, Enon, Clark Co.; Henry Ten Eyck, Hyattsville, Miami Co.; Wm. Palmer, Bloomfield, Fayette Co.; Harmon Carroll, Painesville, Lake Co.; T. M. Kimball, Woodstock, Champaign Co.

SHEEP.

DANIEL MCMILLAN, Attending Member of the Board.

11. CLASS I.—*Merinos.*

Best buck, 2 years old and and over	$20
2d best “ “	10
Best buck under 2 years old	20
2d best “ “	10
Best pen of five ewes, 2 y'rs old and over.	20
2d best “ “	10
Best pen of five ewes, under 2 y'rs old	$20
2d best “ “	10
Best pen of five lambs, regardless of sex.	10
2d best “ “	5

Awarding Committee.—Dr. Caldwell, Piqua Miami Co.; Robert M. Montgomery, Youngstown, Mahoning Co.; A. McFarland, New

Athens, Harrison Co.; Joseph H. Brotherton, Cedarville, Greene Co.; G. W. Leith, Carey, Wyandot Co.

12. CLASS II.—*Silesians.*

Best buck, 2 years old and over	$15
“ under 2 years old	15
Best pen of 5 ewes, 2 y'rs old and over	15
“ 5 ewes, under 2 y'rs old	15
“ 5 lambs, regardless of sex	10

Awarding Committee.—Thos. Gorby, Randolph, Portage Co.; J. C. Stevens, Kenton, Hardin Co.; Wm. Anderson, Finley, Hancock Co.; Jas. McCall, Patriot, Gallia Co.; Robt. Reed, Jr., Dalton, Wayne Co.

13. CLASS III.—*Long Wool Sheep—Leicesters.*

Best buck, 2 years old and over	$15
“ under 2 years old	15
Best pen of 5 ewes, over 2 y'rs old	15
“ 5 ewes, under 2 y'rs old	15
“ 5 lambs, regardless of sex	10

Awarding Committee.—John Q. Smith, Oakland, Clinton Co.; J. H. Quinn, Calcutta, Columbiana Co.; Alex. A. Harbison, Huntsville, Logan Co.; T. C. Wasson, Carey Fork, Adams Co.; Wm. Leuty, Mayfield, Cuyahoga Co.

14. CLASS IV.—*Long Wool Sheep—Cotswolds.*

Best buck, 2 years old and over	$15
“ under 2 years old	15
Best pen of 5 ewes, over 2 years old	15
“ 5 ewes, under 2 years old	15
“ 5 lambs, regardless of sex	10

Awarding Committee.—Smith Thomas, Mt. Gilead, Morrow Co.; Geo. Anderson, Painesville, Lake Co.; Joel Brigham, Wauseon, Fulton Co.; R. Baker, Avon, Lorain Co.; Jared Foresman, Reynoldsburg. Franklin Co.

15. *Sweepstakes on Sheep.*

Best fine wool buck of any age or breed	$20

Committee to be appointed on the grounds.

16. CLASS V.—*Southdown Sheep.*

Best buck, 2 years old and over	$15
“ under 2 years old	15
Best pen of 5 ewes, 2 y'rs old and over	15
“ 5 ewes, under 2 y'rs old	15
“ lambs, regardless of sex	10

Fat Sheep.

Best pen of 5 fat sheep	$15
2d best	10
Best single fat sheep	5
Best 5 fat lambs	10

Awarding Committee.—Jeremiah Dodge, New Lyme, Ashtabula Co.; Wm. Marsh, Owensville, Clermont Co.; J. Park Alexander, Akron, Summit Co.; Dr. G Parry, Florida, Henry Co.; David Laughhead, Xenia, Green Co.

17. CLASS VI.—*Cashmere Goats.*

Best thoroughbred buck	$10
2d best “	5
Best thoroughbred she-goat	5
2d best “	3
Best thoroughbred 3 kids	5
2d best “	3

Awarding Committee.—C. W. Conklin, Sidney, Shelby Co., Jesse Wood, Dudley, Hardin Co.; Joseph Perkins, Cleveland, O.; D R. Houston, Washington, Fayette Co.; Jesse Stubbs, West Elkton, Preble Co.

SWINE.

D. MCMILLAN, Attending Member of the Board.

18. *Large and Small Breeds.*

Best boar over 2 years old	$20
2d best “ “	10
Best “ 1 and under 2	15
2d best “ “	10
Best boar under 1 year old	$10
2d best boar “ “	5
Best sow, under 2 and over 1 year old	15
2d best sow “ “ “	10
Best sow, with litter of not less than 5 pigs	20

2d best sow, with litter of not less than 5 pigs	$10
Best litter of not less than 5 pigs over six months old	15
2d best do	10

Awarding Committee.—Chas. Tyndall, Selma, Clark Co.; David Watson, Milford Centre, Union Co.; B. F. Brown, Piqua, Miami Co.; Jonas T. McKay, Lebanon, Warren Co.; C. S. Gates, Brooklyn, Cuyahoga Co.

19. *Sweepstakes.*

Best boar of any age	$15
Best sow of any age	15

Awarding Committee.—M. Carroll, Painesville, Lake Co.; Chas. Mahan, Van Wert, O.; Stephen Boalt, Norwalk, Huron Co.; Benj. Reed, Greenville, Darke Co.; George Garlinghouse, Haarlem Centre, Delaware Co.

POULTRY.

Best pair of China fowls	$3
2d " "	2
Best pair of game fowls	3
2d " "	2
Best pair of Dorkings	3
2d " "	2
Best pair of Polands	3
2d " "	2
Best pair of Spanish	3
2d " "	2
Best pair of turkeys	3
2d " "	2
Best pair of geese	3
2d " "	2

Largest exhibition of pigeons, not less than six varieties	$5
Largest exhibition of birds, not less than six varieties	5
Best and largest exhibition of poultry owned by one exhibiter	5

Awarding Committee.—S. D. Harris, Cleveland, O.; W. S. Osborn, Findlay, Hancock Co.; John Hoffman, Columbus, O.; J. W. Phillips, Defiance, O.; J. W. Fox, Ravenna, O.; S. Buckland, Fremont, O.

SECOND DEPARTMENT.

D. E. Gardner, Attending Member of the Board.

Models in Classes I., II., III. and IV., cannot compete with full-sized machines.

All machinery, as far as practicable, to be exhibited in motion.

21. Class I.—*Machinery, Engines, etc., etc.*

Best portable steam-engine	$50
2d best " "	25
Best steam-gauge	3
Best preventive of steam-boiler explosion	5
Best portable saw-mill	20
2d best " "	10
Best saw-gummer	2
" self-setting saw-mill head-blocks	5
" stave machine	5
" shingle "	5
Best lath machine	$5
" hoop "	5
" moulding machine	5
" morticing "	5
" sash "	5
" tenoning "	5
" scroll sawing "	5
" wood turning lathe	5
" iron "	5
" iron planing machine	10
" wood "	10
" water wheel	5

Awarding Committee.—Chas. Cooper, Mt. Vernon, O.; John S. Hall, Columbus, O.; H. F. Blandy, Zanesville, O.; A. T. Barnes, Tiffin, O.; A. McDonald, Wooster, Wayne Co.

22. CLASS II.—*Agricultural Machines.*

FIRST DIVISION.

Best threshing machine	$15
“ sweep horse-power	10
“ endless chain horse-power	10
“ threshing machine operated by endless chain power	5
“ circular saw-mill operated by horse-power	5
Best log cross-cut saw-mill, horse-power	5
“ clover huller and cleaner	5
“ clover-huller	5
hemp and flax dressing machine	5
“ cider-mill and press	5
“ dog-power churn	3
“ horse hay rake	3
“ hay, straw and stalk cutter	5
“ hay press	5
“ power corn-sheller	5
“ hand “	2

Awarding Committee.—Wm. B. Jenkins, Painesville, Lake Co.; Job Owens, Hamilton, Butler Co.; Wm. Rouser, Piqua, Miami Co.; H. P. Havens, Delaware, O.; J. E. Burr, Mt. Gilead, Morrow Co.

23. CLASS III.—*Agricultural Machines.*

SECOND DIVISION.

Best wheat drill (2 horse)	$10
2d best “ “	5
Best wheat drill (1 horse)	5
“ grain or grass broadcast sowing machine	5
“ machine for cutting and shocking corn	5
“ clover seed harvester	5
self-raking and reaping machine	5
“ reaping machine	5
“ mowing machine	5
“ combined reaper and mower	5
“ display of reaping and mowing machine knives	5
“ grain binder	5
“ hay pitching machine	3
“ corn planter (horse-power)	5
“ “ (hand)	2
“ potato planter	5
“ potato digger	5
Best field roller and crusher	$5
“ harrow	3
“ corn cultivator	2
“ horse hoe	2
“ double shovel plow	2

Awarding Committee.—Chancey F. Bradley, Delaware, O.; D. W. H. Howard, Ottokee, Fulton Co.; Jesse Beech, Cole Run, Washington Co.; John S. McClung, Ætna, Greene Co.; Josiah Hurst, Dover, Cuyahoga Co.

24. CLASS IV.—*Agricultural Machines.*

THIRD DINISION.

Best portable flouring mill	$10
“ portable grist mill	5
“ smut machine	5
“ farm feed mill	5
“ fanning mill	5
“ flour packing machine	3
“ self-regulating windmill	5
“ willow peeling machine	3
“ stock scales for general purposes, to be set up by exhibiter, and be used by the Board, during the Fair, free of charge	15
“ platform scales	5
“ stump extractor	10
“ brick machine	10
“ drain tile machine	5
“ farm gate	3
“ grindstone	2
“ beehive	3
“ refrigerator	2
“ agricultural boiler	3
“ portable fence	3

Awarding Committee.—J. W. Smith, Bryan, O.; Chas. Smith, Marion, O.; Geo. Norton, Mt. Vernon, O.; Paul Vanderwert, New Antioch, Clinton Co.; Jacob Rohrer, Hyattsville, Miami Co.

25. CLASS V.—*Tools and Household Implements.*

Best display of haying and harvesting tools	$5
“ set of draining tools	5
“ corn husking machine	2
“ farm road scraper	1

Best garden seed drill	$2
" cheese press	3
" cheese vat with heater attached	5
" cheese shelf model	3
" churn	2
" butter worker	1
" cabbage cutter	2
" sausage-meat cutter, and stuffer	1
" washing machine	3
" clothes wringer	2
" mangle or ironing machine	2
" clothes-horse to occupy the least space	2
" half dozen wash-boards	1
" well pump	3
" apparatus for raising water	2
Best and most numerous collection of agricultural implements and machinery manufactured in Ohio, price and utility to be considered	25

Awarding Committee.—A. A. Jewett, Cleveland, O.; Smith Grimes, West Union, Adams Co.; Thos. Bushnell, Haysville, Ashland Co.; David Morrow, Bryan, Williams Co.; Capt. Samuel Davy, Ironton, Lawrence Co.

26. CLASS VI.—*Plows.*

Best plow for general purposes	$10
Best stubble plow	10
Best sod plow	10
Best steel plow	10
Best cast-iron plow	10
Best double "	10
Best subsoil "	5
Best side-hill "	5
Best one-horse "	3
Best mole or blind ditching plow	10
Best open ditching plow	10
Best dynamometer	3
Best steam plow, to be tested to the satisfaction of the committee, and its utility fully demonstrated	50

Awarding Committee.—J. L Wood, Madison, Lake Co.; Jas. C. Miller, Sen., Irwin, Union Co.; A. T. Nye, Jun., Marietta, Washington Co.; W. N. Burke, Jackson, Jackson Co.; F. Hutcheson, Lebanon, Warren Co.

27. CLASS VI.—*Vehicles.*

Best two-horse family carriage	$10
2d best " "	5
Best one-horse "	8
Best top buggy	5
Best trotting wagon	5
Best gig	5
Best farm wagon for general purposes	5
Best spring market wagon	5
Best omnibus	10
Best cart	5
Best street goods wagon	5
Best wagon or carriage break	2
Best jack-screw	1
Best sleigh	5
Best carriage or cab for children	Silv. med.
Best display of carriage wheels, hubs, etc.	5
Best display of carriages and buggies	20

Awarding Committee.—Ed. Williams, Columbus, O.; Capt. Jaynes, New Albany, Athens Co.; —— Driscoll, Springfield, Clark Co.; Joshua Thomas, Zanesfield, Logan Co.; Wm. Doane, Circleville, Pickaway Co.

28. CLASS VIII.—*Sewing and Knitting Machines.*

Best knitting machine	$5
Best sewing machine for manufacturing purposes	5
Best sewing machine for family use	5
Best sewing machine for family use, cost not to exceed $50	5

Awarding Committee.—Wm. C. Earl, Toledo, O.; Jas. Hawse, Delaware, O.; N. S. C Perkins, Norwalk, Huron Co.

THIRD DEPARTMENT.

TEXTILE FABRICS, AND MATERIALS OF WHICH THEY ARE MADE.

WM. R. PUTNAM, Attending Member of the Board.

29. CLASS I.—*Silk, and Fabrics of Silk.*

(Articles to be exhibited by manufacturer.)

Best specimen of silk manufactured, not less than five yards	$3
Best lb. reeled silk, made in family	2
Best lb. sewing silk, made in family	2
Best specimen of raw silk goods	2
Best pair of silk stockings	1
Best pair of silk gloves	1
Best silk shawl	3
Best silk cravat	1
Best piece of pocket handkerchiefs	1

30. CLASS II.—*Mill Fabrics.*

Best 10 yards woolen cloth	5
Best 10 yards cassimere	5
Best 10 yards satinet	5
Best 10 yards jeans	5
Best 10 yards floor-oil-cloth	5
Best 10 yards tweed	3
Best 10 yards cloth of flax cotton	5
Best 10 yards flannel	3
Best 15 yards woolen carpet	5
Best 15 yards tow cloth	3
Best 10 yards linen	5
Best 10 yards linen diaper	3
Best 10 yards kersey	3
Best hearth rug	3
Best double carpet coverlet	5
Best pair of cotton wove stockings	1
Best pair of linen wove stockings	1
Best lb. linen sewing thread	1
Best shawl	3
Best Mackinac blanket	3
Best pair woolen blankets	5
Best stocking yarn	3
Best oil-cloth table cover	1
Best display of cordage	5

Awarding Committee.—E. T. Sturtevant, E. Cleveland, Cuyahoga Co.; T. W. Tallmadge, Columbus, O.; Mrs. J. H. Tyler, Napoleon, Henry Co.; Mrs. Columbus Delano, Mt. Vernon, Knox Co.; Mrs. A. L. Perrill, Lithopolis, Pickaway Co.

31. CLASS III.—*Needle, Shell and Wax Work.*

Best ottoman cover	$3
Best table cover	2
Best fancy chair work, with needle	3
Best fancy chair cushion and back	3
Best woolen shawl	3
Best crotchet shawl	2
Best worked shawl	3
Best lace cape	3
Best lamp-stand mat	2
Best ornamental needle work	3
Best silk embroidery	3
Best embroidered sofa cushion	2
Best " mantilla	3
Best " table spread	2
Best " dressing-gown	3
Best " lady's robe	3
Best " " dress	3
Best " children's clothes	3
Best " under sleeves	2
Best " lady's collar	2
Best " handkerchief	2
Best chenille embroidery	3
Best embroidery with beads	3
Best tetting collar	3
Best worked collar	2
Best " vail	3
Best " handkerchief	2
Best silk bonnet	3
Best knit cloak	3
Best variety of linen embroidery	3
Best group of artificial flowers	3
Best variety "	3
Best specimen of wax flowers	2
Best group "	3
Best specimen of wax fruit	2
Best and largest variety of wax fruit	3
Best specimen of moss or lichen work	3
Best " cone work	3
Best " leaf "	3
Best " flower "	3
Best " shell "	3
Best braid of straw or grass	2
Best specimen of braid work	2
Best embroidered picture	3

Best white quilt	$3
Best worked quilt	3
Best silk quilt	3
Best patchwork quilt	3
Best children's afghan	2

Awarding Committee.—Mrs. Amanda Trotter, Xenia, Greene Co.; Mrs. John Reber, Lancaster, Fairfield Co.; Mrs. H. M. Stokes, Lebanon, Warren Co; Mrs. Horace Norton, Cincinnati, O.; Mrs. D. W. C. Sawyer, Wahoo, Madison Co.; Mrs. Lucius Case, Newark, Licking Co.; Mrs. Amos Layman, Columbus, O.; Miss Kate Myers, Columbus, O.

32. CLASS IV.—*Household Fabrics.*

(Being goods made in family.)

Best 10 yards jeans	$5
2d best “	3
Best pair woolen blankets	5
2d best “ “	3
Best 10 yards flannel	5
2d best “	3
Best woolen carpet, 15 yards	5
2d best “ “	3
Best 10 yards linen	5
2d best “	3
Best 10 yards linen diaper	5
2d best “ “	3
Best 10 yards kersey	5
2d best “	3
Best pair kersey blankets	5
2d best “ “	3
Best rag carpet, 15 yards	5
2d best “ “	3
Best 15 yards tow cloth	5
2d best “ “	3
Best hearth rug	5
2d best “	3
Best double carpet coverlet	5
2d best “ “	3
Best pair woolen knit stockings	2
2d best “ “	1
Best pair cotton knit stockings	2
2d best “ “	1
Best pair by Misses under 12 yrs of age	2
2d best “ “	
Best lb. of linen sewing thread	
2d best “ “	1
Best pair of woolen fringe mittens	2
2d best “ “	1
Best pair woolen mittens	$2
2d best “ “	1
Best pair by Misses under 12 yrs of age	2
2d best “ “	1
Best pair of woolen stockings by Misses under 12 years of age	2
2d best pair of woolen stockings by Misses under 12 years of age	1
Best linen handkerchief	2
Best netting	2
Best worsted knit stockings	2
Best stocking yarn	2
Best woolen shawl	2
Best mill bag	2
Best woolen knit drawers	2
Best woolen knit shirt	2
Best foot-mats	2
Best straw hats	2
Best straw bonnets	2
Best grass bonnets	2
Best gentlemen's shirts	2
Best knit bed spread	2
Best wove bed spread	2
Best 10 pounds dressed flax	5
Best 5 “ bleached flax	2
Best 5 “ flax cotton	2
Best 5 “ flax yarn	5
Best 5 “ of cotton grown in Ohio	5

Articles in this class to be manufactured within the year; and in all cases exhibiters to furnish evidence that the articles are so manufactured. No articles manufactured in factories or out of the family, will be received in this class. Exhibiters must accompany their articles with a certificate of manufacture in the family and within the year.

Awarding Committee.—Mrs. John Reid, Utica, Licking Co.; Mrs. Samuel Lee, Marysville, Union Co.; Mrs. J. G. Lester, Canton, Stark Co.; Mrs. Vause F. Decker, Lithopolis, Pickaway Co.; Mrs. Joseph Clark, Gahanna, Franklin Co.

33. CLASS V.—*Worked Metals.*

Best display of copper work	Silv. Med.
“ brass work	$5 and “
“ axes	$3
“ locks	5
“ door trimmings	3
“ window trimmings	3
“ window blinds or shutter trimmings	3

Best display of saddlers' hardware	$5
“ horseshoes	2
“ horseshoe nails	1
“ files	3
“ plumbers' goods and ware	Silv. Med.
“ gas chandeliers and burners	“
“ lamps	$3
“ general hardware	5
“ iron and steel	3
“ iron fence, including post	3
“ coopers' tools	5
“ mechanics' tools other than coopers'	5
“ table cutlery	3
“ pocket cutlery	3
“ silver ware	5
“ Britannia ware	3
“ clocks	3
“ kitchen utensils of brass or copper	5
“ kitchen utensils of tin	3

Awarding Committee.—R. R. Donnelly, Wooster, Wayne Co.; Valentine Best, Zanesville, O.; John A. Lee, Mansfield, Richland Co.; Rollo Barnum, Warren, Trumbull Co.; Delos Williams, Burton, Geauga Co.

34. CLASS VI.—*Stoves, Castings, &c.*

Best cooking stove for wood	$5
Best cooking stove for coal	5
Best parlor stove	5
Best warming furnace or other apparatus	5
Best cooking range	5
Best parlor grate	3
Best pair ornamental iron vases	3
Best specimen of marbleized iron	5
Best specimen of marbleized stone	5
Best specimen of marbleized wood	5
Best display of hollow iron ware	3
Best ornamental statuary	5
Best ornamental fruit and flower stand	3
Best church bell	3
Best farm bell	2
Best chime of bells	5

Awarding Committee.—Miles Greenwood, Cincinnati; Thos. Greer, Painesville, Lake Co.; C. W. Potwin, Zanesville, Muskingum Co.; Geo. D. Bates, Akron, Summit Co.; —— Greer, Dayton, Montgomery Co.

35. CLASS VII.—*Cabinet Ware.*

Best dressing bureau	$5
Best sofa	5
Best lounge	2
Best extension table	3
Best office chair	2
Best set of parlor chairs	5
Best centre table	5
Best pair of side tables	3
Best set of parlor furniture	10
Best display of furniture	10
Best seats and desks for schools	3
Best writing desk	2
Best book-case	3
Best wardrobe	3
Best sick couch or chair	3

Awarding Committee.—E. E. White, Columbus, O.; Michael Ohmer, Dayton, Montgomery Co.; J. H. Heldman, Mansfield, Richland Co.; Wm. Scott, Granville, Licking Co.; Thos. Bond, Troy, Miami Co.

36. CLASS VIII.—*Wooden Ware.*

Best display of cedar ware	$3
“ pine ware	3
“ oak ware	3
“ window shades	2
“ window blinds	3
“ willow ware	3
“ split wood baskets	2
“ pine, oak, or walnut doors	3
“ flour, pork and tight barrels	3
“ grain measures	2
“ butter firkins	2
“ worked flooring	2
“ turning lathe work	3
“ osier willow	2

Awarding Committee.—U. C. Deardorff, Canal Dover, Tuscarawas Co.; J. S. Cox, Delaware, Delaware Co.; John Rounds, Summerfield, Noble Co.

37. CLASS IX.—*Saddlers' and Shoemakers' Ware.*

Best traveling trunk	$5
Best carpet sack	2
Best set of carriage harness	5
Best set of farm harness	5
Best display of leather	5

Best display of saddles and bridles	$5
Best display of hames and saddletrees	3
Best display of brushes	3
Best display of shoe-lasts, pegs, and lasting machine	3
Best pair of dress boots	2
Best pair of heavy boots	2
Best pair of gent's dress shoes	2
Best pair of Congress gaiters	2
Best pair of lady's gaiters	1
Best pair of lady's slippers	1
Best pair of bootees	1
Best display of bound account books	5
Best display of paper manufact'd in Ohio	5
Best display of paper hangings and borders	3
Best Ohio made silk hat	2
Best Ohio made soft hat	2
Best Ohio made fur cap	2
Best made suit of gentleman's clothing	5
Best display of mattresses	5
Best display of printing	5
Best display of gloves and mittens	3
Best display of ladies' furs	3

Awarding Committee.—Lewis Baltzell, Tiffin, Seneca Co.; Martin Warner, Tontogamy, Wood Co.; H. C. Tombes, Ashtabula, Ashtabula Co.; D. W. Winfaugh, Jackson, Jackson Co.; Richard Nevins, Columbus, O.

38. CLASS X.—*Philosophical, Surgical, Dental, Drawing, Painting, Surveying, and Leveling Instruments and Apparatus, etc., of fine workmanship, exhibited by maker*—American manufacture.

Best surgical instruments	Diploma.
Best set optical instruments	Diploma.
Best set dentist's instruments	Diploma.
Best set math. and phil. instrum'ts.	Sil. Med.
Best specimens dentistry	Diploma.
Best theodolite	Diploma.
Best level	Diploma.
Best surveyor's compass	Diploma.
Best achromatic telescope	Diploma.
Best reflecting telescope	Diploma.
Best optical apparatus	Diploma.
Best balance	Diploma.
Best thermometer	Diploma.
Best barometer	Diploma.
Best electro-magnetic apparatus	Diploma.
Best electric telegraph	Diploma.
Best electric machine	Diploma.
Best galvanic bat'y and apparatus	Diploma.
Best set drawing instruments	Diploma.
Best chronometer	Diploma.
Best clock (8 day)	Diploma.
Best specimen silver-ware, with agricultural designs, suitable for premiums	Diploma.
Best specimen Argentine or Britania ware	Diploma.
Best turned and cast Britania	Diploma.

[It is understood that all products of industry competing for premiums, are to be exhibited by or for the maker, or improver, or contriver.]

Awarding Committee.—Professor Hamilton Smith, Gambier, Knox Co.; Prof. Asa Stoddard, Oxford, Butler Co.; Prof. E. B. Andrews, Marietta, O.; Dr. Hills, Columbus, Ohio.

39. CLASS XI.—*Chemicals.*

Best ivory-black	$1
" Prussian blue	1
" copal varnish	2
" glue	1
" prussiate of potash	1
" linseed oil	1
" white lead	1
" display of soap	2
" display of candles	2
" specimens of lard oil	1
" display of potash, saleratus, pearlash and other alkalies	2
" display of writing fluid	1
" display of blacking	1
" display of best lubricating petroleum	3
" display of best illuminating petroleum	3

Awarding Committee.—Dr. G. H. Fickhardt, Circleville, Pickaway Co.; Prof. T. G. Wormley, Columbus, O.; Dr. B. B. Leonard, Logan, O.; Prof. Hosford, Hudson, Summit Co.; Dr. Lansing, Chillicothe, Ross Co.

40. CLASS XII.—*Glass, Crockery, Stone-ware, Bricks and Tiles*—American manufacture.

Best specimen Rockingham ware	Diploma.
Best stone ware	do

Best specimens ground glass....	Diploma.
Best specimens stained glass....	do
Best water pipe of water lime..	do
Best sample drain tile..........	do
Best looking glass	do
Best plate glass.................	do
Best window glass...............	do
Best flint glass..................	do
Best bottle glass	do
Best bottles, green glass........	do
Best vials, "	do
Best tinctured and other stoppered bottles and vials..........	do
Best retorts and receivers, tubulated and plain...............	do
Best demijohns	do
Best carboys.....................	do
Best terra cotta.................	do
Best fire bricks	do
Best pressed brick..............	do
Best tiles	do
Best pottery, various kinds.....	do
Best display of stone ware	$3
Best display of glass ware	3
Best display of queensware..............	5

Best suit of the useful minerals of Ohio, including,

Coals of Ohio.
Iron ores of Ohio.
Limestones of Ohio.
Marble of Ohio.
Sandstones of Ohio.
Marls of Ohio.
Peats of Ohio.
Soils of Ohio.
Salt waters of Ohio.
Minerals of Ohio.
Potters' clay of Ohio.
Fire clay of Ohio.
Burr stones of Ohio.
Gypsum of Ohio.

Best dressed stone
Best mill "
Best marble of Ohio.
Best barrel coarse salt.
Best " common salt.
Best sack table salt.
Best barrel lime.
Best hydraulic cement.
Best collection of minerals illustrating the geology of Ohio.
Best collection illustrating the ornithology of Ohio.
Best collection of natural fishes, living or dead.
Best suit of crystallized minerals of Ohio.
Best suit of crystallized minerals from all parts of the world.
Best suit of fossils of Ohio.
Best suit of the vegetable kingdom, including the woods and most useful plants of Ohio.
Best suit of the animal kingdom, including insects injurious to the farmer.

Such awards as the Board shall deem best, on the recommendation of the committee, will be made.

Awarding Committee.—Rev. E. Bushnell, Fremont, Sandusky Co.; Dr. J. Sanns, jr., Gallipolis, Gallia Co.; E. G. Fenn, Medina Co.

FOURTH DEPARTMENT.

WM. P. McClung, Attending Member of the Board.

Farm Products, Food, Condiments, etc.

41. Class. I.—*Field Crops—Ohio.*

To be awarded at the annual meeting of the State Board, at Columbus, in January next.

Best crop of wheat, not less than five acres, nor less than 40 bushels per acre.	$40
Best crop of Indian corn, not less than five acres, to be shelled and weighed between the 15th of November and 1st of December, not less than one hundred bushels per acre	$40
Best crop of barley, not less than five acres, nor less than 50 bushels per acre	20
Best crop of rye, not less than five acres, nor less than 40 bushels per acre.....	20
Best crop of oats, not less than 5 acres, nor more than 60 bushels per acre...	20

Best crop of buckwheat, not less than one acre, nor less than 30 bushels per

acre	$10
Best crop of beans, not less than one acre, nor less than 25 bushels per acre	10
Best crop of potatoes, of good table quality, not less than half an acre, nor less than 200 bushels per acre	20
Best crop of sweet potatoes, not less than one-fourth of an acre	10
Best crop of onions, not less than one-fourth of an acre	10
Best acre of broom corn	10
Best five acres of flax-seed, not less than 12 bushels per acre	10
Best two acres of timothy hay	10
Best acre of clover seed	10
Best acre of timothy seed	10
Best acre of orchard grass seed	10

Specimens and detailed statement of the experiments to be presented for the Board at the January meeting.

42. CLASS II.—*Flour and Grain.*

Best barrel flour (Ohio manufacture and Ohio wheat)	Dip. and	$5
2d best	"	3

To be exhibited by the manufacturer, with a statement of the variety and quantity of wheat necessary to make it.

Best sample of white winter wheat not less than half a bushel	$3
2d best do	2
Best sample of red winter wheat, not less than half a bushel	3
2d best do	2
Best sample spring wheat, not less than half a bushel	3
2d best do	2
Best sample of Mediterranean wheat, not less than half a bushel	3
2d best do	2
Best sample rye, not less than half a bushel	3
Best sample oats, not less than half bush.	3
" barley, "	3
" buckwheat, "	2
" flax-seed "	3
" hops, not less than 5 lbs	3
" timothy, not less than half bu.	3
" clover seed, "	3
" blue grass seed, "	3
" red top seed, "	3
" orchard grass seed, "	3
Best sample yellow corn	$2
2d best do	1
Best sample white corn	2
2d best do	1
Best sample early corn	2
2d best do	1

☞Evidence must be presented showing that grain, vegetables and products have been grown by the exhibiter.

Awarding Committee.—P. D. Biglow, Findlay, Hancock Co.; John Maidlaw, Ottawa, Putnam Co.; Gilbert Terrill, Jeffersonville, Fayette Co.; Marshall McCall, Cadiz, Harrison Co.; Manning Stiers, Logan, Hocking Co.

43. CLASS III.—*Cheese.*

Best cheese, 1 year old and over	$10
2d best do	5
Best and largest lot	20
2d best do	10
Best cheese, under 1 year old	10
2d best do	5

The competitors must state, in writing, the time it was made; the number of cows kept; whether the cheese was made from one, two, or more milkings; whether any addition was made of cream; the method of preserving and preparing rennet; the mode and amount of pressure, and the treatment of the cheese afterward; and shall answer the following questions:

1st. What do you consider the best breed of cows for dairy purposes?

2d. What variety of grasses produce the best pastorage for making cheese?

3d. Does long continued grazing for dairy purposes exhaust or improve your land for dairying?

4th. At what price per acre can land be profitably used for dairy purposes in Ohio?

5th. What is a proper temperature of a room for curing cheese, and what effect does a higher or lower temperature produce upon the flavor and other qualities of the cheese?

6th. State in *detail* your process of making and curing cheese, including the preserving and preparing rennet for use, etc.

No premium to be awarded unless all the ules are fully complied with, and all the questions properly answered.

Awarding Committee—Able Krum, Cherry Valley, Ashtabula Co.; H. B. Perkins, Warren, Trumbull Co.; L. Langden, Brunnersburg, Defiance Co.; L. I. Randall, Chardon, Geauga Co.; E. Wilkins, Scott, Adams Co.

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44. CLASS IV.—*Butter, Bread, etc.*

Best lot 10 lbs. butter in rolls	$10
2d best “ “	5
Best lot, not less than 25 lbs made in May or June	10
2d best lot, not less than 25 lbs., made in May or June	5
Best tub or firkin, not less than 50 lbs., made at any time	10
2d best tub or firkin, not less than 50 lbs., made at any time	5

The competitors must state, in writing, the time when it was made; the number of cows, and whether any other food than grass was given them; the treatment of the milk before churning; mode of churning and freeing the butter from the milk; the quantity and kind of salt used, and whether saltpetre, sugar, or any other substance has been employed.

BREAD AND CEREAL FOOD.

Best 3 loaves baker's bread, not less than 48 hours old	$3
Best pilot bread	2
“ biscuit	2
“ soda biscuit	2
“ crackers, butter	2
“ “ sweet	2
“ “ Boston	2
“ 3 loaves of domestic white bread, not less than 48 hours old	3
“ domestic corn bread	3
“ “ rye bread	3
“ “ brown bread	3

In preparing bread, no salaratus, or other alkalies or acids to be used.

Best six hams, mode of preserving to be stated in writing	3
Best 6 beef tongues	3
Best 6 pieces dried beef, not less than 8 lbs. in a piece	3
Best half bbl. mess pork	3
Best half bbl. mess beef	3
Best half bbl. white fish	3

Awarding Committee — H. P. Cannon, Twinsburg, Summit Co.; Mrs. James Buckingham, Zanesville, O.; Mrs. Samuel D. King, Newark, Licking Co.; Mrs. H. H. Kimball, Columbus, O.; Mrs. J. B. Stone, McConnelsville, Morgan Co.; Mrs. John Gross, Circleville, Pickaway Co.

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45. CLASS V.—*Honey, preserves, pickles, etc.*

Best 10 lbs honey	$5
2d best “	3

The honey to be taken without destroying the bees, and kind of hives to be specified, as well as the general management of the bees during the year.

Best beehive	$3
Best canned tomatoes	1
Best “ blackberries	1
Best “ raspberries	1
Best “ peaches	1
Best “ pears	1
Best “ apples	1
Best “ quinces	1
Best “ cherries	1
Best “ gooseberries	1
Best “ currants	1
Best “ grapes	1
Largest and best variety of canned fruits	5
“ “ pickles	5
“ “ jellies	5
“ “ preserves	5
Best apple jelly	1
Best currant jelly	1
Best peach jelly	1
Best quince jelly	1
Best preserved quinces	1
Best “ peaches	1
Best “ pears	1
Best “ apples	1
Best “ plums	1
Best tomato catsup	1
Best cucumber catsup	1
Best cucumber pickles	1
Best pickled cucumbers	1
Best “ peaches	1
Best “ tomatoes	1
Best “ walnuts	1
Best “ butternuts	1
Best “ mangoes and melons	1
Best “ onions	1

Best pickled gherkins	$1
Best specimen of portable soup	1
Best " concentrated vegetables	1
Best " " milk	1

Awarding Committee.—John M. Glover, West Liberty, Logan Co.; Miss Lucy Waddle, Chillicothe, Ross Co.; Mrs. Ball Gwynne, London, Madison Co.; Mrs. McMullen, Milford Centre, Union Co.; Mrs. J. R. Nash, Xenia, Green Co.

48. CLASS VI.—*Sugar.*

Best sorgho mill	$10
2d best " Silver Medal or	7
Best sorgho evaporator	10
2d best " Silver Medal or	7
Best half acre sorgho made into syrup*	20
2d best do Silver Medal or	7
Best 10 lbs. sorgho sugar †	40
2d best "	5
Best gallon sorgho syrup	10
2d best "	5
Best gallon maple syrup	5
Best 10 lbs. maple sugar	5

*The culture of the plant, and process of manufacture, and quantity of syrup produced, to be stated in writing, sworn to by the manufacturer, and filed with the Secretary.

† The sugar to be manufactured during the Fair, on the grounds, from the sorgho or imphee cane.

Awarding Committee.—To be appointed on the grounds.

49. CLASS VII—*Vegetables, roots, etc.*

Best half bushel Neshannock potatoes	$3
2d best do	1
Best half bushel pinkeye potatoes	2
2d best do	1
Best half bushel blue potatoes	2
Best half bushel peach-blow potatoes	2
Best half bushel of any other variety not named above	2
Best and greatest variety of Irish potatoes, half peck of each variety	5
Best half bushel sweet potatoes	3
2d best do	1
Best 12 parsnips	2
Best 12 carrots	2
Best 6 long blood beets	$2
Best 6 turnip beets	2
Best 6 sugar beets	2
Best display of beets in variety and quality	4
Best peck of tomatoes	2
2d best do	1
Best display of tomatoes in variety and quality	4
Best 3 drumhead cabbages	2
Best 3 heads of red Dutch cabbage	2
Best 3 heads of any other variety not named above	2
Best 3 heads of cauliflower	2
Best 3 heads of broccoli	2
Best 6 heads of lettuce	1
Best half peck of red onions	1
" " yellow onions	1
" " white onions	1
Best display of onions in variety and quality	3
Best half peck of peppers for pickling	1
Best display of peppers in variety and quality	2
Best 6 roots of salsify	1
Best 6 stalks of celery	2
Best 3 marrow squashes	2
Best 3 Hubbard squashes	2
Best 3 crook-necked squashes	2
Best display of squashes in variety and quality	4
Best and largest pumpkin	2
Best display of pumpkins in variety and quailty	3
Best peck of sweet corn in ear	2
Best display of sweet corn in variety and quality	3
Best 3 mountain sweet watermelons	2
Best 3 watermelons of any other variety	2
Best 3 green-fleshed muskmelons	2
Best 3 yellow-fleshed muskmelons	2
Best and greatest display of melons of all varieties, both watermelons and muskmelons	4
Best 6 radishes	1
Best half peck of Lima beans	2
" " white bunch or soup beans	2
" " kidney bunch beans	2
" " pole beans other than Lima	2
" " field peas	1
" " garden peas	2

Best and greatest variety of peas	$3
Best half peck gherkin cucumbers	1
Best two apple-pie melons	1
Best 3 purple egg plants	1
Best 6 stalks of rhubarb	2
Best and greatest variety of vegetables raised by one exhibiter	10

Awarding Committee.—D. C. Richmond, Sandusky, Erie Co.; Jos. Jannison, Lebanon, Warren Co.; E. S. Willard, Cleveland; Wm. Rawle, Toledo, O.; Samuel Creswell, Cedarville, Green Co.

FIFTH DEPARTMENT.

Wm. F. Greer, Attending Member of the Board.

FLOWERS.

48. Class I.—*Professional List.*

STOVE AND GREEN-HOUSE PLANTS.

Best collection of not less than 20 varieties, variety and growth being taken into consideration	$10
2d best do	5
Best 12 varieties do	5
2d best "	3
Best specimen plant in or out of bloom.	3
Best collection of not less than 10 varieties of varigated leaved plants, in or out of bloom	5
2d best do	3
Best single specimen	1
Best collection of aloes and cactus in pots	2
Best collection of fuchsias in pots, growth and variety taken into consideration	3
2d best do	2
Best collection geraniums in bloom, not less than 10 varieties	3
2d best do	2
Best collection gloxinias and achimenes	2
Best collection ferns and lycopodiums..	3
2d best " "	2
Best and largest collection verbenas grown in pots, growth and bloom particularly considered	3
2d best do	2
Best and greatest variety petunas in pots	2

All plants in the above list should be exhibited in the pots in which they were grown, making allowance for the necessary shifts.

CUT FLOWERS.

Largest and best collection of dahlias, not less than 24 named varieties	$5
2d best do	2
Best 12 do	3
2d best 12 do	1
Largest and best collection of roses, named varieties	5
2d best do	2
Best 12 do	3
2d best 12 do	1
Largest and best collection verbenas, named varieties	3
2d best do	2
Best 12 distinct named varieties	2
2d best do	1
Largest and best collection phloxes, named varieties	2
2d best do	1
Best display asters	2
" gladiolus	2
Best display of coxcombs and amaranths	2
2d best " "	1
Best and greatest display cut flowers in variety and quality other than above.	3
2d best do	2
Best pair parlor boquets, without regard to style	1
Best pair hand boquets, without regard to style	2
2d best do	1

Awarding Committee.—D. B. Pierson, Cincinnati, O.; Robert W. Steele, Dayton; Henry D. Sprague, Newark; Henry B. Curtis, Mt. Vernon, Knox Co.; Joseph Perkins, Cleveland.

49. CLASS II.—*Amateur List.*

Same as in professional list.

OPEN TO ALL.

Best floral ornament	$5
2d best	3
Best and most beautifully arranged basket of flowers for table	3
2d best do	2
Best and most beautifully arranged hanging basket of growing plants	3
2d best do	2

Awarding Committee.—Mrs. O. Follett, Sandusky, Erie Co.; Mrs. H. Williams, Delaware, O.; Mrs. Geo. Parsons, Columbus; Mrs. Lewis B. Gunckel, Dayton; Mrs. C. C. Converse, Zanesville.

FRUITS.

50. CLASS III.—*Apples.*

Each variety to be named when entered.

Best 10 varieties, not less than 5 each	$5
2d best “ “	3
Best 6 varieties of apples	3
2d best “	2
Best arranged basket of 10 varieties, not less than half a bushel	3
2d best do	2
Best display in variety and quality	10
2d best	5

Awarding Committee.—T. S. Humrickhouse, Coshocton, Coshocton Co.; J. C. Coe, Sidney, Shelby Co.; J. Austin Scott, Toledo; Geo. Dana, Belpre, Washington Co.; T. W. McMillen, Wilmington, Clinton Co.

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51. CLASS IV.—*Peaches.*

Each variety to be named when entered.

Best 6 varieties, not less than 6 each	$5
2d best “ “	3
Best plate of one variety, not less than 6 specimens	2
2d best do	1
Best and greatest display	8
2d best “	5

PEARS.

Best 10 varieties, not less than 5 each	$5
2d best “ “	3
Best 5 “ “	3
2d best “ “	2
Best 3 “ “	3
2d best “ “	2
Best peck of one variety	3
2d best “	2
Best display in variety and quality	10
2d best “ “	5

QUINCES.

Best 12 quinces	$3
2d best	2

PLUMS.

Best 3 varieties, not less than 6 each	$3
2d best “ “	2
Best plate, of not less than 12 each	2
2d best	1

RASPBERRIES.

Best quart of raspberries	$3
2d best “	2
Best collection of native uncultivated fruits	5
Best collection of native uncultivated nuts	5
Best peck of Ohio cranberries	5
Best peck of whortleberries	3

Awarding Committee.—Dr. J. A. Warder, Cincinnati; Dr. H. C. Beardsley, Painesville, Lake Co.; Z. Pullen, Lebanon, Warreñ Co.; Wm. D. Kelly, Ironton, Lawrence Co.; Dr. Ed. Taylor, Cleveland, O.

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52. CLASS V.—*Grapes.*

HARDY.

Each variety to be named when entered.

Best 6 varieties, not less than 4 bunches each	$5
2d best 6 varieties, not less than 4 bunches each	3
Best 3 varieties, not less than 6 bunches each	3
2d best 3 varieties, not less than 6 bunches each	3
Best new seedling	4
2d best “	4
Best display, not less than 10 varieties, 3 bunches each	10
2d best do	5

FOREIGN.

Best plate grown in open air	$2
Best 3 varieties, 2 bunches each, grown under glass	4
2d best do	3
Best display, not less than 6 varieties	6
2d best “ “	4

Best bunch	$1

Awarding Committee.—Henry C. Noble, Columbus, O.; W. B. Peck, Portsmouth, Scioto Co.; J. W. Harker, Xenia, Greene Co.; Wm. Rogers, Cleveland, O.; Mr. Huntington, Kelly's Island, Erie Co.

SIXTH DEPARTMENT.

WM. F. GREER, Attending Member of the Board.

FINE ARTS.

53. CLASS I.—*Drawings, Paintings, etc.*

Best life size photograph, colored in oil, by Ohio artist	Silv. Med. & $10
2d best do	Diploma and 5
Best specimen of painting, in oil, by American artist.	10
Same, by foreign artist	10
Best specimen in water colors	Silver Medal.
Best specimen in oil by foreign artist	“
Best specimen in water colors, by foreign artist	Diploma.
Best specimen uncolored photograph	Silver Medal.
2d best do	Diploma.
Best specimen of not less than 12 different objects of natural history, in water colors	Diploma & $2
2d best ditto	Diploma.
Best specimen of fruit painting	Silver Medal.
Best specimen flower paint'g	“
Best specimen daguerreoty's	“
Best drawing of Fair grounds for Board of Agriculture	“
Best specimen of Ohio landscape, in oil, by Ohio artist	“
Best exhibition of paintings by Ohio or foreign artist	Sil. Med. & $10
2d best do	10
Best fancy painting, by Ohio artist	Silver Medal.
Best fancy painting in water colors	Silver Medal.
Best engraving	“
Best wood engraving	“
Best lithography	“
Best porcelain painting and gilding	“
Best specimen of penmanship	Diploma.
Best crayon drawing	“
Best pencil drawing	“
Best pen drawing	“

Awarding Committee.—Committee to be appointed on the grounds.

54. CLASS II.—*Sculpture, etc.*

Best sculpture	Diploma.
Best collection of marble work	Medal & $10
2d best do	Silv. Medal.
Best carving in wood	Diploma.
Best architectural drawings	“
Best specimen of marble sculpture	Silv. Medal.
Best collection of the greatest variety of insects	“
Best collection and greatest variety of Ohio birds, prepared	“
Best collection and greatest variety of quadrupeds, prepared	“

55. CLASS III.—*Designs.*

Best design for a farm house	Diploma.
Best design for a farm barn	“

Best design for carriage house and stable	Diploma.	
Best design for dairy house	"	
Best design for poultry house	"	
Best design for farm gate	Diploma & $2	
Best design for granary	"	3
Best bridge (model of)	"	
Best domestic gas apparatus (or model of)	"	

Designs must be accompanied with estimates of cost and specifications. Those to which premiums may be awarded, will be engraved and published in the Report of the Board of Agriculture. To be exhibited at State Fair, and premium to be awarded by the Board at the January meeting.

Awarding Committee.—Committee to be appointed on the grounds.

56. CLASS IV.—*Musical Instruments.*

Best grand or semi-grand piano-forte	Silv. Med.
Best boudoir piano	"
Best square piano	"
Best violin	"
Best parlor organ	Diploma.
Best melodeon	"
Best melopean	"
Best æolian	"
Best dulcimer	"
Best flute	"
Best clarionet	"
Best set of band instruments	"

Awarding Committee.—G. W. Pierson, Dayton, O.; Prof. Powell, Bellefontaine, Logan Co.; Robt. Gates, Lancaster, Fairfield Co.

On motion, it was ordered that a contract for all the lumber necessary for the structures, fence, etc., for the ensuing fair be made with A. Carlisle, at $26 per 1,000 feet for all lumber less than twenty feet in length, and $28 per 1,000 for all over twenty feet.

On motion, adjourned to meet at call of the President.

STATE AGRICULTURAL ROOMS, May 20th, 1864.

Executive Committee met pursuant to call—Messrs. Greer and DeWitt* also present.

Ordered that the contract to print 1,500 posters, three sheets in size and in two colors, for $280, be awarded to Messrs. Benedict, Fairbanks & Co., of Cleveland, O.

Ordered that the printing of 7,000 premium lists, for $275, be awarded to Richard Nevins, of Columbus, O.

Ordered that the entry cards and other card printing be awarded to Messrs. Glenn, Thrall & Heide, they being the lowest bidders for that class of work.

Ordered that the proposition of Mr. Asa Tyler to put up the fence and stalls on the fair grounds at 45 cents per rod be accepted.

The remainder of the session was consumed in discussing the number and size of halls, their arrangement, etc., on the ground.

In compliance with a request from the Governor, Mr. Klippart was granted leave of absence to visit Louisville and Nashville to look after the sick and wounded which were then expected from the battle-field below Nashville.

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* On returning towards his home in Cleveland, on Saturday morning, May 21st, the car in which Messrs. Greer and DeWitt were seated was thrown from the track. Mr. DeWitt was almost instantly killed, and Mr. Greer severely wounded.

STATE AGRICULTURAL ROOMS, June —, 1864.

Executive Committee met pursuant to call of the President.

Mr. Klippart absent, having, by request of the Governor, proceeded to "White House," Va., to look after the sick and wounded.

Ordered that the contract for digging and walling eight or more wells at one dollar per foot, and brick at five dollars per thousand, be awarded to Charles Dice.

The following proposition from the Soldiers' Aid Society not meeting the views of the Board in every respect, and the parties making the proposition having learned by this time that they could not redeem the pledge therein made, the Secretary was authorized to receive proposals for furnishing appropriate refreshments in booths on the fair grounds; the parties to erect their own booths, and either to pay a ground rent, or, in lieu of that, to furnish members of the Board and committeemen with refreshments at half the usual rates charged:

COLUMBUS, O., May 9, 1864.

J. H. Klippart, Esq., Secretary of the Ohio State Board of Agriculture:

DEAR SIR—The undersigned, committee of, and in behalf of the Ladies' Soldiers' Aid Society of Columbus, beg leave to submit the following proposition in regard to the eating and refreshment department of the approaching State Fair:

They will provide all necessary refreshments for any number of persons who may be present at the Fair, consisting of coffee, cold meats, cakes, pies, sandwiches, fruits, ice cream, lemonade, etc., at booths or stands located in various parts of the ground, making their own terms with regard to prices, but they will not erect or use any dining hall or give meals at any particular hour of the day.

They will erect a suitable number of booths to insure ample provision in the way of food and refreshments for all persons who may attend the Fair, provided they have the exclusive monopoly of all sales of refreshments within the inclosure.

Very respectfully,

MRS. L. P. DORSEY, *President.*
MRS. I. C. ASTON, } *Executive Committee.*
MRS. G. W. HEYL, }
MRS. W. E. IDE, }

G. VOLNEY DORSEY, } *Com. of Gentlemen.*
WM. G. DESHLER, }
FRANCIS C. SESSIONS, }

Ordered that Asa Tyler be appointed Superintendent of the Fair Grounds, to erect all the necessary buildings, at the rate of $3 per day, and that he be allowed $500 for putting up the fence and stalls, in lieu of 45 cents per rod; furthermore, that he shall accurately measure every load of lumber as it is delivered upon the grounds.

On motion, adjourned to meet on September 13th at the State Fair.

NEIL HOUSE, FRIDAY, Sept. 16, 1864.

Board satisfied with pedigree of John H. Rarey's colts.

Two year old colts in roadster class *not* shown in harness not entitled to premium.

Report of Committee on Dentistry set aside, because one member only of the committee acted.

Mounted marshals to receive four dollars per day.

Superintendents three dollars per day.

Mr. Welsh, mounted marshal, did not act on Friday.

Mr. Tyler to have his wages continued as long as there is any necessity for his services.

It is agreed that Mr. Tyler shall have a gratuity of fifty dollars; it is agreed that a gratuity of twenty dollars each be allowed to S. F. DeWitt and M. D. Brooks; it is agreed to pay John F. Ijams a reasonable compensation for his services, say five dollars per day for self and team.

Superintendents to be paid for the time they were engaged in service.

Agreed to pay Josiah Hurst $4.90 for counterfeit three dollar bill returned, and $1.90 for weighing straw.

Resolved, That the Secretary be authorized to draw up a letter of condolence relative to the death of Mr. Wm. DeWitt, and send a copy to Mrs. DeWitt.

COLUMBUS, O., Sept. 16th, 1864.

The present meeting of the Ohio State Board of Agriculture being the first regular meeting of said Board which has taken place since the untimely death of our associate and co-laborer, William DeWitt, therefore be it

Resolved, That in the death of William DeWitt, the Ohio State Board of Agriculture has been deprived of the services of one of its most active, energetic, and devoted members; that an excellent citizen in the prime of life and in the height of his usefulness has been removed, for he was one who had proved himself worthy and well qualified in all departments and relations of life, and amidst all the vicissitudes of fortune he ever remembered his manhood, his duty to his Creator and his fellow man.

Resolved, That we deeply sympathize with his bereaved and afflicted family in this their hour of trial and distress, who have lost a dutiful and affectionate husband, a kind and indulgent father.

Resolved, That these resolutions be recorded in the book of records of the State Board of Agriculture, and that the Corresponding Secretary transmit a copy to the family.

By order of the Board,

JOHN H. KLIPPART,
Corresponding Secretary.

Agreed that the Board demand $5,000 and the care of the grounds for the fiscal year (to September, 1865) to insure the location of the fair for 1865 in Columbus.

State Agricultural Rooms,
Saturday, September 17th, 1864.

Ordered, that a certificate of merit be awarded to S. F. DeWitt and M. D. Brooks, for their efficient police services.

Ordered, that no duplicate diplomas be issued by the Secretary.

January 3d, 1865.

Members present—N. J. Turney, President, W. F. Greer, Rec. Secretary, T. C. Jones, Jas. Fullington, Wm. B. McClung, D. E. Gardner, W. R. Putnam, D. McMillan.

The President appointed Messrs. Gardner and McClung committee on Executive Committee's accounts, Greer and Putnam, committee on Treasurer's accounts, McMillan and Fullington, committee on Cor. Secretary's accounts, Jones and Taylor, committee on Farm Crops, Gardner, Jones and McClung, committee on Commended Premiums.

The committee on Treasurer's accounts reported as follows:

The undersigned, committee to examine accounts and vouchers and the vouchers of David Taylor, Treasurer of the Ohio State Board of Agriculture, beg leave to report as follows:

Balance on hand Jan. 3d, 1864		$29,676 37
Gross receipts in 1864		22,165 80
		$31,842 17
Amount expended for claims of 1863	$1,916 57	
Amount paid Ohio Pomological Society	300 00	
Amount general disbursement	21,716 41	
Cash on hand	7,909 19	
		$31,842 17

Respectfully submitted,
W. F. GREER,
W. R. PUTNAM,
Committee.

Columbus, O., Jan. 3d, 1865.

Having examined the account of the Corresponding Secretary, we find it correct, with a balance due him of $356 63.

D. McMILLAN,
JAMES FULLINGTON,
Committee.

CONVENTION OF DELEGATES.

TUESDAY, JAN'Y 3, 1865.

The President, N. J. Turney, Esq., called the meeting to order, at 10 o'clock, A. M., and immediately proceeded to business.

The Secretary called the roll, when the following delegates were found to be present:

COUNTY.	NAME.	COUNTY SEAT.
Ashland	Wm. B. McCarty	Ashland.
Ashtabula	James P. Jennings	Jefferson.
Athens	W. P. Johnson	Athens.
Belmont	Shepard Davis	St. Clairsville.
Brown	P. L. Wilson	Georgetown.
Butler	John M. Millikin	Hamilton.
Carroll	Robert Raley	Carrollton.
Champaign	N. H. Horr	Urbana.
Clark	Alex. Waddle	Springfield.
Clermont	John H. Branch	Batavia.
Clinton	Cyrus Linten	Wilmington.
Columbiana	S. W. Clarke	New Lisbon.
Coshocton	John Miskimmon	Coshocton.
Cuyahoga	S. D. Harris	Cleveland.
Delaware	R. McKinney	Delaware.
Fairfield	Col. Connell	Lancaster.
Fayette	J. N. Beatty	Washington.
Franklin	Jared Foresman	Columbus.
Geauga	Thos. Carroll	Chardon.
Greene	J. R. Nash	Xenia.
Guernsey	Hugh Broome	Cambridge.
Hamilton	John K. Greene	Cincinnati.
Hardin	J. C. Stevens	Kenton.
Harrison	Jamieson	Cadiz.
Huron	Alvin Brightman	Norwalk.
Jackson	James Tripp	Jackson.
Lake	Geo. Anderson	Painesville.
Licking	David Smith	Newark.
Logan	Amos Gore	Bellefontaine.
Lorain	N. B. Gates	Elyria.
Lucas	Wm. Rawle	Toledo.
Madison	Robt. Boyd	London.
Mahoning	L. T. Foster	Canfield.
Marion	E. Messenger	Marion

COUNTY.	NAME.	COUNTY SEAT
Medina	W. H. Witter	Medina.
Miami	W. B. McLung	Troy.
Morgan	John B. Stone	McConnellsville
Morrow	A. H. Wrenn	Mt. Gilead.
Muskingum	Jas. Buckingham	Zanesville.
Noble	John Kirk	Caldwell.
Pickaway	Z. H. Perrill	Circleville.
Portage	Fred. B. Cannon	Ravenna.
Preble	Isaac J. Morris	Eaton.
Putnam	John Maidlaw	Kalida.
Richland	B. S. Runyon	Mansfield.
Ross	Hugh Bell	Chillicothe.
Sandusky	J. L. Greene	Fremont.
Seneca	Wm. Lang	Tiffin.
Shelby	Edmund Lytle	Sidney.
Stark	W. H. Alexander	Canton.
Summit	H. P. Cannon	Akron.
Tuscarawas	U. C. Deardorff	New Philadelphia.
Union	J. W. Robinson	Marysville.
Warren	J. M. Roosa	Lebanon.
Washington	Wm. R. Putnam	Marietta.
Wayne	J. G. Troutman	Wooster.
Wyandot	T. V. Reber	Upper Sandusky.

AGRICULTURAL EDUCATION.

Judge T. C. Jones said that he believed the Secretary had a paper prepared on the subject of Agricultural Colleges, and he presumed this would be as convenient a time as any in which to read it.

J. H. Klippart, Esq., the Secretary, then came forward and read as follows:

Since mankind have become civilized, there has been no one industrial pursuit, which has not only been found to be indispensably necessary, but which at the same time has contributed more to promote the comfort, well-being, and consequent happiness and progress of the human race than agriculture. It is the foundation upon which the entire superstructure of enlightenment and refinement has been built. By and through it the arts and sciences have been developed and brought to their present state of perfection, for it has necessarily engendered commerce; and commerce has not only covered every sea and ocean with broad white sails, bearing the agricultural products from one country to another, but in its turn has developed the art of ship-building in all its various stages of improvement, until we have attained to the perfection of iron steamers, together with most the other mechanic arts; it has developed the sciences of astronomy and of meteorology, which in turn react upon agriculture. Commerce stimulated by agriculture, has dug our canals, and spread a net-work of railroads over every civilized and enlightened country. All the physical sciences owe their development to agriculture, and have in times past, and do yet, not only minister to our comfort and happiness, but serve to the further development of the better qualities of our nature.

Whilst none of these attributes of the important part played by agriculture in the civilized world has ever been disputed by reflecting minds, there is at the same time no industrial pursuit which has been so studiously neglected, and so lightly esteemed by the mass of mankind as *this*, the most glorious and beneficent of all human occupations.

Until a comparatively recent period in the world's history, agriculture was almost entirely intrusted to bondmen and slaves, and in such hands it could not be expected that much progress would be made. So long as the natural fertility of the soil, by simply plowing and seeding, produced sufficient to support the population of the country, no improvement could reasonably be expected. Hence, so long as the population of England did not consume the entire product of the soil, no attention was given to agriculture, but it was left to plod its weary way as best it could. We find that up to the year 1770, England was an exporter of breadstuffs, and from 1770 until 1793 she produced just as much as she consumed; but from and after 1793, she became an importer of breadstuff. At this latter period her products did not suffice to supply the home demand; and we find also at about this time some of the more intelligent Englishmen were endeavoring to discover some method to increase the productiveness of the soils. Many fens and marshes were drained, and thus more arable area secured; but this did not suffice—she had arrived at that period in her history when the natural fertility of the soil would no longer maintain her population. And from this period agricultural progress may be dated in England. The same was true of the continent of Europe, in a general sense.

The more intelligent of the peasantry in France—although in no sense better than English *villeins*, or Roman slaves—were fully convinced that if the agricultural dictatorship or directory could be wrested from the hands of the nobility and clergy, there would be no more occasion for being afflicted with a decennial famine. All persons may not be aware of the fact, that prior to the revolution of 1789, there was a death penalty affixed to what was then considered a crime, namely, to dispose of agricultural products grown in one department, to dealers or persons in an adjoining department, without a permit from the throne. In addition to this, the clergy and nobility owned about two-thirds of France, and directed, or rather dictated, how much seed should be sown to the acre, and what specific fields should be grown in specific crops—how many and what kinds of cattle should be kept on the estate. The result of this system of farming was a complete famine in every department about once in ten years. It was to correct this abuse, rather than to dethrone Louis

XVI, or to drive out the church and the nobility, that the peasantry inaugurated the revolution of 1789. The position occupied by the nobility of Great Britain, (who own all the lands in England, Scotland, and Ireland), the influence of the Romish Church and the French nobility, have concealed from the world the true cause of the revolution of 1789. It was too dangerous and too humiliating to the British nobility to acknowledge that it originated in a denial of the rights of the agriculturist—of the laborer who fed and clothed these same noblemen.

We find Arthur Young in England, Lavoisier in France, Von Thaer and Von Fellenberg on the Continent, earnestly engaged between the years 1790 and 1806, discussing and directing public attention to the condition of agriculture.

Up to the year 1800 agriculture had been pursued as the mechanical arts were pursued; that is, men were taught how to plow, when and how to sow the seed, according to the notions prevalent at that time; for beyond plowing and seeding, they knew either very little or absolutely nothing of the conditions necessary for the development of the plant other than rain, dew, and sunshine. The farmers had no idea of the true cause of the fertility of the soil, nor that cultivation caused infertility. Agriculture was pursued precisely as the art of photography is pursued to-day. Photography is the crowning gem in the diadem of chemical discovery, and yet not one in a thousand who practices the art of photography has ever read a treatise on the science of chemistry, or understands the entire properties or philosophy of the chemicals or apparatus which he employs day after day and year after year. He is as ignorant of the scientific principles which he puts into requisition, as one who had never beheld a camera. How then is it expected that they can make any improvement in the art? Almost all the improvements made in photography were made by persons who did not practice the art, but were made by those who had studied and were familiar with the laws of light; who were well versed in optics, and who understood chemistry. So in agriculture, the improvements in agriculture were not made by those who followed the plow, but rather by ingenious mechanics, chemists, and physiologists. It may be argued that so long as the State of Ohio can maintain two and a half millions of people, and export ten million bushels of wheat, fifty million bushels of corn, in the form of three hundred thousand head of cattle and three million head of swine, and fifteen to twenty million pounds of wool, that there is no great necessity for agricultural improvement. But this argument is no better than that of the red man of the forest, who argues that when his squaw has secured an ample store of wild rice and Indian corn, and he has secured a good store of game, that any further exertion on his part is uncalled for and unnecessary. There is a higher moral and political obligation enjoined upon us than there is upon the red man. The full development of all our faculties which the Creator has bestowed upon us will be demanded at our hands, and until we have arrived at the ultimatum of all human knowledge and improvement, we, as a race or people, will not be released from this obligation. But there is an absolute necessity at the present time for agricultural improvement, and no other argument is required to convince any reflecting mind than the fact that the soil in Ohio does not produce as much per acre as it did forty years ago; neither does it produce as much as the virgin soils of the West. Hence we find many good farmers selling their farms in Ohio and removing to the West. In 1860 there were 4,690 farmers less in Ohio than in 1850. This is a relative loss of 54,513, according to the increase of population.

> "The improvement in agricultural implements and machinery, and the introduction of entirely new machinery and implements, are exercising a great influence upon the agricultural condition of the State.
>
> In 1840 there were 272,579 farmers in the state—to 17.9 per cent. of adult male population
> 1850 " 269,690 " " 13.6 " " "
> 1860 " 265,000 " " 11.3 " " "
>
> Between 1850 and 1860 the Grain Drill, Reaping and Mowing Machine, Combined Thresher and Cleaner, were generally introduced throughout the State. From 1850 to 1860 many improved implements, which considerably reduced manual labor, were introduced. If the farmers had increased in numbers in proportion to the aggregate population from 1840 to 1850, then in 1850 there should have been 365,258 farmers; but instead of this actual increase of 92,679, there was an absolute decrease of 2,889. Again, if farmers had increased in the same relative ratio as the aggregate population from 1840 to 1860, then in 1860 there should have been 419,771 farmers in the State. The introduction of improved and new implements and machinery, since 1840, is then, according to this calculation, equivalent to the labor of 154,771 men; since we have just this number of farmers less than the ratio of farmers to the increase of population. In other words, the labor-saving machinery in the State takes the place of 154,771 laborers, and allows them to go to the battle field without disturbing the agricultural interests of the State, and the only extent to which agriculture suffers, in this respect, is the difference between the number relieved by machinery and the number actually sent, viz, 175,000—being a draft on the farming population of about 20,000."

We have commercial facilities, as a State, unparalleled by any State in the West! We have a more thoroughly efficient system of common schools—nay, we are not *surpassed* in *this* respect by any State in the Union. Would it not be better for the State and for society in general, and would not more rapid strides be made in agriculture, if these farmers had remained within the State and improved their farms, thus rendering them more productive, even, than the virgin soils of the West now are? The truth is, that there are very few farmers in the State who are unwilling to sell their farms at the first opportunity which presents itself, when a fair price is offered. And it is no departure from the truth to state, that not one farmer in fifty intends to remain permanently on the farm he now occupies, provided he can make an advantageous sale of it. So long as farms are bought and sold with as much facility as horses are, just so long may we expect the fertility of the soil to decrease. Another reason is that intimated before, namely, that agriculture is pursued as an ART, in which an appropriate apprenticeship has possibly been served, and the proper use of the tools acquired by the operator, but the elements, principles and rationale are as little understood as the photographer understands the laws and combinations of chemistry.

If the principles of agricultural improvement were as well understood and practiced as the principles of commerce or mercantile conduct are, then not one farmer in fifty could be found willing to dispose of his farm, even at a greatly increased price. In commercial or mercantile life, every improvement is eagerly seized, every new principle readily reduced to practice; vast sums of money invested, which, to the uninitiated appears almost as reckless as to stake it upon the cast of a die. Yet the trader or commercial man is governed in his actions by well established rules, and acts in conformity to the best established usages in his avocation. Hence, men brought up to commercial or mercantile life, as a general rule, make far more enterprising and successful farmers than those who have been reared on the farm itself. The commercial man has learned by experience that every judicious investment for improvement enhances the value of the property; and when such investments are applied to the improvement of the soil, he is well convinced that they will pay as well in the shape of increased crops as if invested in bank stock or U. S. 7-30 bonds. It is therefore very necessary that the young farmer be taught FARM MANAGEMENT, or the *business* part of farming, as well as the mere *mechanical* part of it—the same as the commercial man is taught the management of an extensive and heavy business house, as well as how to sell goods; for after all, much of the success in farming depends upon the management, or "financiering," as it is generally termed.

As moisture is evaporated from the earth's surface and drawn up into the atmosphere, there forming clouds to decend in the fullness of time to the earth, to renew the fertility and arouse the vital principle of plants, so agriculture has been sending forth, silently and unobserved, the elements and principles of the greater part of the natural sciences; these elements and principles have, in the hands of learned men, been reduced to such a form that they may now be applied to practical agriculture. There is no doubt in the minds of men properly informed upon this subject, that when these sciences are properly applied to practical agriculture, that the result will be as salutary to agriculture as the spring showers are to vegetation. But here, at the very threshold, is where the greatest difficulty presents itself to us. How shall the practical farmer obtain such a knowledge of these sciences as to be of any practical value to him? Germany was the first to feel the absolute necessity of a better system of farming; was the first to inaugurate a system of agricultural education.

Although, towards the close of the last century she had many able agricultural writers, prominent among whom was Von Thaer, yet it was not until 1806 that the first Agricultural College was inaugurated by Von Fellenberg. In his, as well as in many subsequently inaugurated ones, many purely speculative doctrines were taught, which were not corroborated by practice; at the same time many new and important truths were disseminated, and on the whole, great progress was made in agriculture. The doctrines of Humphrey Davey, Chaptal, Schuebler, and others, were finding a practical response in England, France and Germany, and contributed in no slight degree to the abolition of many time-honored but unproductive practices. The advent of Leibig's Agricultural Chemistry, in 1840, produced almost a complete revolution in the system of continental farming; and what is especially worthy of consideration is, that it was a revolution which did not go backward, aud to-day Prussia and her dependencies number sixty-nine agricultural colleges, with experimental farms attached, together with quite a number of special experimental stations.

The influence and result of these colleges and experimental farms, may be viewed from several stand-points; and viewed from whatever point, they nowhere appear in an unfavorable light. They have disseminated a higher order of practical knowledge, both in agriculture and the various technological departments; they have recreated and entirely reformed the veterinary science, and developed much, very much otherwise dormant talent and ability. They have elevated the moral standard of the nation, for they have made labor respectable; and if an Agricultural College in Ohio should produce this one result, without any other, it would amply repay the investment. If it is urged that these colleges have exerted no practical influence upon agriculture, I can only cite a few "figures" as my reply:

"Those who are of opinion that science properly applied, or special education for that purpose, can be of no benefit to agriculture, can not certainly be familiar with the history of agriculture during the past century in Europe. A few facts and figures in relation to this point may not be out of place here. In Prussia the area cultivated at present is the same that it was a hundred years ago. Annexed is a tabular statement of the product per square (Prussian) mile, together with the product *per capita* of the population in 1755, 1800, and 1854:

	1755.		1800.		1854.	
	Bushels.	Per capita.	Bushels.	Per capita.	Bushels.	Per capita.
Wheat	1,023	0·36	2,653	0·78	18,391	2·53
Rye	11,240	4·21	16,891	5·78	34,100	4·67
Barley	5,403	2·08	7,448	2·53	14,850	2·00
Oats	8,092	3·06	10,750	3·64	40,726	5·57
Mixed crops	467	0·13	405	0·12	8,455	1·10
Peas	319	0·12	393	0·10	8,378	1·21
Potatoes	793	0·25	8,307	2·84	119,735	16·38
	28,337	10·21	46,847	15·79	244,635	33·46
Population	2,641	....	2,951	....	7,310	....

"From this statement it will be seen that in 1755 the population was 2,641 per square (Prussian) mile—equal to 22¼ of our square miles—and that the entire product per square mile of all the crops used as food for the inhabitants, amounted to ten and one-fifth bushels for every individual. About 1780, considerable attention was directed to improvement in agriculture in that country, and by the year 1800 the aggregate of cereal crops was almost doubled. or would have given every individual, if the population of 1755 had not increased, seventeen and three-fourth bushels; but as the population did increase somewhat, the average *per capita* was a little over fifteen and three-fourth bushels. About 1800 the doctrines of Thaer and Von Fellenberg were finding a practical response in the improvement of almost all departments of agriculture. Agricultural schools, colleges, universities, and experimental farms sprang up in many places in Prussia. The result of this agricultural education is that in 1854, when the population amounted to 7,310 per square mile, the aggregate production amounted to 244,635 bushels, or about *nine* times the amount produced on the same area one hundred years previous, and gave an average of thirty-three and one-half bushels to every individual of a population which had almost tripled during the century.

"The population per square mile of 1854 could not have been subsisted on the product of a square mile in 1755, whilst the population of 1755 would have had more than nine times the amount in 1854 than they had in 1755. No one will argue that the soil of its own accord really became *more* productive by reaping a hundred crops from it. The increased productiveness then must be attributed to an improved system of culture, and this improved system could have had no other origin than intelligence, or, in other words, APPLIED SCIENCE. The figures just quoted are a much stronger argument in favor of agricultural education than the most rhetorical essay could possibly make."

And this increase of produce has neither attained its highest point, nor is it confined to the cereal crops; it extends to the production of meat, wool, and commercial plants. The improvement in veterinary science alone, has more than remunerated the entire expense of these colleges on the continent. Before the inauguration of these colleges, a sick animal was generally destroyed at once, or it eventually died of the disease, producing no return to the owner, nor yielding any revenue to the Government. Now, however, more than nine-tenths of the number which formerly were destroyed or died of disease, are placed in the hands of skillful veterinarians, and their cure is almost invariably certain.

England has no public agricultural colleges; the one at Cirencester, I am led to believe, is practically a failure, and this is the only one which is claimed as being in any degree a public institution of this kind in England. In the first place it was intended to impart scientific agricultural knowledge to the sons of tenants or practical farmers, but it was soon discovered that this class of pupils were deficient in the preparatory courses of education. Next, an endeavor was made to impart this scientific knowledge, in connection with practical operations, to the landlords' sons; but here it was found that the "sprigs of nobility" would not condescend to perform any kind of manual labor; and now, if my information is correct, this college is devoted to instructing the sons of landholders in the business of farm management. But there are many private agricultural schools in England, and to these more than to anything else, except the cash capital necessary to put the science into practice, is England really indebted for her excellent and productive system of agriculture. Fifty years ago a farm in Essex county, England, produced eight bushels of wheat only per acre; at present Mr. Mechi harvests *five quarters* or forty bushels per acre from the same farm.

How shall we teach agriculture in Ohio? If we teach it at all, we *must* teach it as a *practical science*. I am well aware that a great majority of farmers have not the slightest confidence in "*book*" knowledge as applied to agriculture—or that farming can be taught anywhere else than on the farm itself. Agricultural writers themselves are to blame for this loss of confidence; just as, several centuries ago, medical writers were to blame for loss of confidence in their profession. A man had died from loss of blood; thereupon the medical world proclaimed that the blood was the seat of life: another died from the fracture of the skull; then it was asserted that the head was the seat of life: another died of consumption; they then believed that the lungs were the seat of life; and so on throughout the entire viscera, every part of which was in turn declared to be the seat of life. So with agricultural writers; one declares that plaster is the best manure; another asserts that lime is; then a more expensive school of writers declare in favor of guano; and last of all came the writers on the *superphosphates*. Then there is a class of writers of an entirely different school, who have the utmost confidence in electricity, heat or light; another set who advcoate underdraining subsoil and deep plowing. Then again, there are those who must have some *chemistry* connected with it. Now, there is no *one* of these doctrines which embraces the entire scheme of agriculture any more than that the seat of life is restricted to any one portion of the body. All are necessary to make a complete whole. There was a time when a great *furore* prevailed with regard to analysis of soils as the great *panacea* for the cure of agricultural infertility. Now, an analysis of the soil is most assuredly a rational step in the right direction, but it is nothing more than a mere step; because, without a correct and definite knowledge of what to apply to render the soil fertile, the analysis is really of no practical advantage. A man is sick, and the physician has diagnosticated his disease; now, it is well enough, perhaps, to know all about the disease, but the patient is more interested in knowing what will cure him; and unless the proper remedy is known all diagnosis in the world are useless. The physician possibly may prescribe cod liver oil, hypophosphite of lime, or some other popular remedy, without any possibility of removing the disease; so agricultural doctors, after having an analysis, go on prescribing lime, plaster, marl, muck, humus, guano or superphosphate—all to no purpose, because we do not yet know all about the physiology of plants; and, until we do know much more than is at present known, much of this "*scientific*" prescription is nothing better than mere guess-work. Hence the analysis of soils is of just as much importance to the scientific farmer as the diagnosis is to the physician; but in either case these acquirements are of no value practically if the proper remedy remains unknown. Hence the necessity of an experimental farm in order to learn the proper manures, or other treatment to be applied to increase fertility after an analysis of the soil has been made; so that the student, when he leaves the Agricultural College, can say, as the student from Hohenheim told his father, when he returned home with his agricultural diplomas. "Well, my son, what have you learned at Hohenheim?" "*Certainties*, father, *certainties*. I have learned to know what effects certain causes will produce." It is argued that, if the students at the college are to be obliged to perform manual labor, they will become disgusted with the institution, and it will fail for want of pupils. I am fully persuaded that any young man, whether a student in an agricultural college or elsewhere, who considers it derogatory to his dignity to perform necessary manual labor, will never make a successful farmer. And any young man, who considers himself disgraced by performing necessary manual labor at an agricultural college, did not enter it with a proper intent or spirit; for all agricultural operations involve more or less manual labor, and it is just as absurd to undertake to teach practical agriculture without labor, as it would be to teach gunnery or practical artillery without firing cannon.

It is well known that all the manures mentioned have produced wonderful results in some instances, and in others have failed entirely to produce any change whatever; so, too, of all the mechanical applications. There are instances on record where deep plowing had proved to be positively injurious; and so of the other processes; therefore an experimental farm is absolutely necessary as an adjunct to the agricultural college. And, if I remember correctly in my reading, I believe that every agricultural college, inaugurated *without* an experimental farm, whether in England, France or on the Continent, has proved to be a complete failure.

After years of earnest solicitation, Congress not only saw the propriety, but felt the necessity of recognizing the importance of agriculture, and promoting its progress. It, therefore, made a very generous donation of 630,000 acres of the public domain as an endowment for an agricultural college in the State of Ohio, where the mechanic arts should be taught, and where classical education should not be ignored. The act of Congress making this donation expressly provides a fund for experimental farms, and a college organized under this grant, which does not have an experimental farm, does not comply with the organic act, and can not, therefore, be entitled to participate in the endowment. The Legislature of Ohio having accepted this grant from Congress, it now becomes in part the duty of this convention, representing the agricultural interest of the State, to determine what amount of land is necessary for an experimental farm; for this matter is now virtually in the hands of the agriculturists of the State. It may be well to glance at the kind of experiments to be conducted on these farms. As Ohio has at least fifty millions of dollars invested in horses, forty millions in cattle, twenty millions in sheep and thirty millions in swine, or an aggregate of one hundred and forty millions invested in live stock, there should be a good herd of brood animals of every pure race of domestic animals kept on the farm, for the purpose of ascertaining more definitely all the qualities of the domestic animals than is now known; also, as living specimens to teach and study the laws of breeding, as well as fattening, training, and otherwise improving them. It is not impossible that, by proper attention to the selection of breeding animals, and a proper knowledge of the laws of reproduction, a race of animals may be obtained as much superior to the present race of short horns, as the short horns are superior to the common cattle on the streets. Every intelligent breeder knows the reputation acquired in this direction by Robert and Charles Colling, by Bakewell, by John Ellman, by Jonas Webb; and every one knows, or ought to know, what is attributed to Mr. Hammond, of Vermont, in the improvement of sheep. Every student at the college should be taught by practical illustrations of the living animals the methods pursued by the Collings, Bakewell, Webb and Hammond. Very many experiments are yet necessary to develop the physiological laws of cattle feeding, and there is no place so appropriate to make these experiments as at the college. When we reflect for a moment upon the great changes and improvements which the horticulturists have produced in fruit and flowers, we can not fail to be convinced that the vegetable world is, to a much greater extent, subject to improvement and modification by human agency than the animal kingdom is. All the endless varieties of roses have been produced from two or three original species; all the apples have originated from the crab apple; all the pears from a wild pear unfit to eat, and all the varieties of strawberries from the common meadow strawberry. Are we to believe that all the improvements and modifications in this direction have attained their prescribed limits? Are not our farm crops susceptible of similar improvement? We know that wheat is susceptible of great improvement. In 1857 Mr. Hallett, of England, selected a head of wheat, measuring 4⅜ inches, containing 47 grains, from a stool of less than ten stocks, and pursued a horticultural system of improving it, and in 1861 he had the gratification to find the finest head out of 52 from the same stool, measuring 8¾ inches, and containing 123 grains. Here, then, in the 5th crop, the length of the wheat-head was doubled, the stools increased about six-fold, and the number of grains in the head almost tripled! thus increasing the product, taking the number of stools into account, something more than fifteen-fold!

We do not yet know precisely how deep to sow or plant wheat, notwithstanding the fact that wheat has been grown for thousands of years. Neither do we know whether thick or thin seeding produces the best crops; now it is possible that the proper depth of seeding, as well as thick or thin seeding, depends entirely upon the time it is sown, and the kind of weather at seeding time. Although considerable clover is grown, we do not know the effect of clover on the soil, nor its effects upon the future crops. We know very little, if anything, of the philosophy, or actual effects of the rotation of crops, or in what *order* crops should be rotated. Experiments which will positively discover all these points, can no where be so properly made as on the experimental farm, because a prominent part of the business will be to make experiments, and proper preparations will be made so as to secure a complete knowledge of all the conditions, adjuncts, and influences.

Experiments with the cultivated grasses are necessary. It is a singular as well as lamentable fact, that as a general thing farmers have such a limited positive knowledge on the comparative nutritive qualities of grasses. From the number of cattle in the State, one would be led to believe that the subject of grasses, if none other, was well understood by the farmers of Ohio. But there is the widest possible range of diversity of opinion relative to the nutritive value of timothy, blue grass, red top, and orchard grass. And no one of the advocates for or against any of these grasses, can refer to any complete series of experiments, such as should have been made, on which to establish his conclusions. And what is more, no one farmer can or will take the time and incur the expense of making such experiments. It has cost the aggregate people of Ohio, in time, money, fuel, labor, machinery, &c., all of half a million of money before they learned how to produce a good, marketable article of Sorgho Syrup. Now, if we had had an experimental farm and college, these experiments could have been made there, at no expense to the people. We probably will spend another half million in experimenting with the Beet

Root. Satisfactory experiments must not be limited to a single year, nor to a single variety of soil; they must extend through a series of years, so as to include the effects of drouth, as well as of excessive moisture—on clay soils, on loam soils, and on gravelly soils—on lands not drained, as well as on under-drained; manured, as well as on those not manured. In fact all of our cultivated lands are susceptible of improvement, and land enough is requisite on which to experiment with these crops—land in the natural state, land under-drained, land plowed deep, land plowed shallow, land sub-soiled, manured, manured and deep plowed, manured and underdrained—crops sowed early, sowed late, sown in combination with other crops, &c., &c. For all these experiments to be conducted year after year, in horticulture, agriculture, and with live stock, will require in my judgment at least 500 or 600 acres. Very few experimental farms in Europe are less than 600 acres.

Memorials were presented to the State legislature last winter, proposing to donate the Miami University, Ohio University at Athens, and the college at College Hill, near Cincinnati, to the State, each to be an agricultural college. I am informed that memorials from these same institutions will again be presented this winter, together with memorials from several others. Each one of these institutions is tendered as a donation to the State, provided the State will in turn make it one of the agricultural colleges of the State, and give it an equitable portion of the endowment. It appears very singular that the trustees, directors, stock-holders, and professors of every one of these institutions have so very suddenly discovered their perfect adaptability to be transformed into agricultural colleges, and teachers of practical agriculture and *veterinary science*. They can not claim that they were ignorant of the value and the necessity for agricultural education, and if their institutions were so well adapted for this purpose, why was not some attempt made to teach it? I believe that I am not misstating the facts when I assert that not a single series of lectures have been delivered in any one of them on the subjects of practical agriculture, veterinary surgery, or practical botany. In one of these institutions, I am informed, several courses of lectures on hypothetical agriculture were delivered, and although having an abundance of chemical apparatus, not a single analysis of soils has been made, not a single manure analyzed. Has agricultural education become so suddenly popular, or have these institutions, during their entire term of existence, studiously ignored it? Did the professors not know that many of the ablest scientific minds of the nineteenth century were devoted to the investigation and development of the science of agriculture; and that there is now an agricultural literature in existence which will compare favorably with if not absolutely outrank that of many of the sciences taught in these institutions? This studied neglect of agricultural science at these institutions is what causes many reflecting minds to regard their present generous offers as being actuated by motives of very doubtful character. And these same reflecting minds argue that either the entire system of college education and the management of these institutions is a failure, or else that an attempt will be made to divert the Congressional endowment from its legitimate purpose. It will be found much more difficult to teach agriculture and the mechanic arts in one of those institutions, which for a series of years heretofore has enjoyed a purely literary or classical reputation, than in an entirely new institution. Professor Edward Hitchcock, President of Amherst College, Mass., in 1855 or 1856 gave a detailed account of the difficulties and annoyances he encountered among the classical students when he introduced a scientific course of studies in that college, and especially the branches of geology and palæontology. Many young men came from other colleges to take a course of geology and palæontology, and they were compelled to submit to all manner of taunts, studied neglect, and contumely on the part of the classical students—so much so, that class after class in geology became disgusted with the institution, and discontinued their studies. He told me that it required a much greater degree of moral courage than young men generally possessed to brave all these taunts, and studied neglect and coldness which were continually showered upon them. The classical students endeavored in every possible manner to have the scientific department discontinued, but failing to do so, finally charged the President with being an *infidel* in disguise. The trustees or curators several times waited upon Mr. Hitchcock, to either suspend his office or dismiss him; and he felt himself obliged in self-defense to write his book on Religion and Geology, and upon its appearance the *theological* class discontinued their studies at that college.

A medical department was attached to Hudson or the Western Reserve College, but it was very soon found convenient to remove the medical department to Cleveland, whilst the classical yet remains at Hudson. In almost every college where a scientific department has been added, there is a standing feud between the scientific and classic students. This is now unhappily the case at Union College, and is true in an alarming degree at the Michigan State University, or Agricultural College; and the same difficulties may reasonably be expected to follow if *practical* agriculture, veterinary science, and the mechanical arts are attached to and form a course at our present colleges.

If it is supposed that I am dealing severely with the institutions that are offering themselves as recipients for this Congressional endowment, I can only say that I am doing nothing more than repeating in a very candid and perhaps blunt manner, the sentiments and opinions of some of the most intelligent agriculturists of the State.

What we want, then, in Ohio is *one* institution where agriculture and the mechanic arts are the leading features—the professors' chairs to be filled by the best talent in the several specialties which the world can furnish. Individually I would be in favor of employing such a man as Prof. Anderson, of Edinburg, to fill the chair of practical agriculture; such a man as Prof. Way or Voelker, of Cirencester, to fill that of agricultural chemistry; such a man as Prof. Simonds, of the Royal Veterinary College of London, to fill that of veterinary science; such an one as Prof. Liebig to fill the chair of vegetable physiology. In the departments of botany, geology, civil engineering, and the mechanical departments, employ men the most eminent in those departments. The reason for employing such men as the European professors just named is, because they have a world-wide reputation in those branches, which they have made their specialties for life. I would like to see all these chairs filled by native American talent. I have reason to believe that my *acquaintance*, either personal or otherwise, with prominent agricultural writers, or those who have made scientific agriculture their specialty, is not *more* limited than that of men in general; and I surely would deem it a very difficult task to select a competent corps in the United States to fill the chairs named.

If the fund granted by Congress will be sufficient to endow three or more colleges at present in existence to carry out the full intent of the donor, then there is a sufficient fund to put into existence an entirely new institution, unconnected with any history or precedents. It is not probable that the Legislature will select *one only* from among the present or intended applicants for endowment. If the proposition of the Miami University is accepted, then there is no good reason for rejecting the application of the Ohio University at Athens; and if both are accepted, then it will be found that both of these institutions are in the southern part of the State, and the northern portion will have cause for complaint; if, then, the colleges at Mt. Union or Hudson are accepted in addition to these two, then, possibly, the central portion of the State will feel aggrieved. If Delaware is accepted in addition to one in the northern portion and the two southern ones, then there will be *four* institutions devoted to agriculture, when it is not yet a settled fact that even *one* will succeed. Will it not be better, gentlemen of the Convention, to put only *one* institution into active operation before any attempt is made to increase the number? If *one* institution cannot be sustained and succeed in all that the Congressional donation requires, how will it be possible to make four or more succeed?

Gentlemen will find that the entire scheme of public instruction in the State will be affected by the establishment of an agricultural college. Hence there will be danger of having the funds diverted from the original intent, if they are placed in the hands of any other than those known to be devoted and earnest friends of agricultural education. I should not be surprised to see a bill presented by the Legislature to establish normal schools from a portion of this endowment. Of course, these normal schools are to be agricultural normal schools in name, but really for the purpose of being an adjunct to our present system of common schools.

The feature of experimental farms must not be overlooked; and it is as strictly enjoined by the act of Congress donating the lands as the teaching of the classics or military science is. The Congressional act provides an endowment for colleges "where the *leading* object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches as are related to agriculture and the mechanic arts, in such manner as the Legislatures of the States may respectively prescribe, *in order* to promote the liberal and PRACTICAL education of the industrial classes in the several pursuits and professions of life;" "and that a sum not exceeding ten per centum upon the amount received by any State under the provisions of this act may be expended for the purchase of lands for sites or experimental farms." Now, it may be well to define some of the terms of the law of Congress, in order to know precisely what is required of us, and *firstly*, what is meant by agriculture? Webster says, agriculture, "in a general sense, the cultivation of the ground, for the purpose of producing vegetables or fruits for the use of man and beast; or the art of preparing the soil, sowing and planting seeds, dressing the plants and removing the crops. In this sense, the word includes gardening, or horticulture, and also the raising and feeding of cattle and stock." Hence, we are not only authorized, but are strictly enjoined to teach the rearing and feeding of cattle or stock in a *practical* manner at these colleges; and, as the veterinary science is inseparable from a correct knowledge of rearing and feeding cattle or stock, it of course is a "branch *related* to agriculture," and consequently must be taught, as well as budding, grafting, layering and hybridizing plants. What is the definition of the term "*practical?*" Webster says, "Pertaining to practice or action." "Derived from practice or experience; as *practical* skill or knowledge; he then says see the word PRACTICE, and defines practice 1, frequent or customary actions; 2, actual performance, *distinguished* from THEORY; 3, exercise of any profession, as the *practice* of law or medicine; the *practice* of arms." According to Webster's definition of terms, then, the branches related to agriculture shall and must be taught by "actual performance."

I trust that those of my friends who are of opinion that if the agricultural branches were taught by a course of lectures, on the one hand, and those others of my friends who are opposed to the manual labor system and experimental farms, on the other hand, will at least acknowledge that I have the law on my side of the question.

It may be well for those interested in agricultural education in Ohio to be advised of what is being done in some of the other States. In Iowa, the State University and several colleges were tendered to the State, as proper recipients for the endowment. But Ex-Gov. Grimes, deeming it best to have a young State start out *right*, succeeded in having a tract of 625 acres selected as the site for the college and experimental farm. The buildings are now in the course of erection. One of the Directors called on me on the 10th of December, to obtain the names of breeders of Short-horn, Devon Hereford Ayrshire and Alderney cattle; of Leicester, Southdown, Cotswold, Shropshiredown, French Merino, Spanish Merino and Silesian sheep. He told me that they had a hard struggle to secure the appropriation of the endowment in the proper channel; that almost every educational interest in the State was endeavoring to absorb or divert it.

Since he was here I learn that he has made the following purchases of thorough-bred stock for the Iowa Agricultural College Experimental Farm: From R. A. Alexander, Woodford county, Ky., one Durham bull calf, one Ayrshire bull, 18 months old, one Lexington filly, one stallion colt and one shepherd pup; from Messrs. Warfield Bros., Ky., one 2 year old and one yearling Durham heifer; from D. McMillan, Xenia, Ohio, "Jessamine," a 2 year old Durham heifer; from G. W. Penney, Newark, Ohio, four South-Down ewes; from F. P. Vergon, Delaware, Ohio, one buck and two ewes, Leicesters; from Hills and Jones, Delaware, Ohio, South-Down buck lamb; from Judge Chaffee, Astabula, Ohio, one pair Cotswold ewes; from Thomas Aston, Elyria, Ohio, one bull and two heifers, Herefords.

In Illinois a contest is being strongly waged between the agricultural and mechanical interests. The mechanics insist upon a division of the fund, and a mechanical institute or college be erected in Chicago, for the reason, as they allege, that the natural place for a mechanic is in a city or town, and the natural place for a farmer is in the country. The agriculturists, on the other hand, threaten to apply to the Supreme Court for an injunction if the Legislature divides the fund. The agriculturists of Illinois insist that the Congressional act contemplates the teaching of the varied branches in the same institution. Wisconsin will erect a new building, and have a well-sized experimental farm. Pennsylvania will divide the endowment between the present Agricultural College in Centre County and an entirely new establishment to be erected in the eastern portion of the State. Rhode Island has accepted Brown University. In most of the New England States local subscriptions are being raised, to be added to the Congressional donation, to create entirely new institutions, which shall comply in letter and in spirit with the act donating the endowment. Massachusetts has located at Amherst. As to the action in New York, I am not advised. Maryland has a good farm school which will be converted into an agricultural college.

After all, the Congressional endowment is nothing more nor less than a *trust* fund; and if the Legislature should see proper to accept the propositions from Athens and Oxford, on the ground that they are already State Institutions, and practical agriculture should *not* be taught there; whether the agricultural students relinquish their studies for the reason that the geological classes disbanded at Amherst, or for any *other* reason, then Congress can at any time withdraw the endowment, and compel the State to refund any sums which may have been expended. It was especially to guard against such occurrences as those at Amherst, and also to guard against a diversion of the fund, that Congress reserved the right to reclaim the endowment, both principal and interest, if the purpose for which it was assigned was not consummated.

Local pride and political influences will undoubtedly have much to do in determining the location; but men of expanded views, and having the best interests of the State at heart, will consider the matter of location of minor importance, especially as almost every portion of the State is readily accessible, and the climate and meteorology of the State are not so varied that agricultural operations in one portion are *not* applicable to other portions of the State.

Congress did not entertain the most remote idea of interfering with our present system of education. It intended that our common schools, high schools, seminaries, and colleges should pursue the even tenor of their way, whilst it would introduce and establish a system of *practical* education not to be acquired at any of the present institutions. Young men complete their ordinary collegiate course, and then go to some professional college, as a Law College, Medical, Theological or Commercial College, to complete their education for their specialty or profession for life. The agricultural college is to be placed on a par with these professional colleges. The agricultural college is not intended to educate clergymen, physicians and attorneys, but to educate, in a liberal, classical and *practical* manner, *mechanics* and FARMERS. And it is our duty as citizens of Ohio, having the agricultural interests of the State at heart, to see to it that this fund is not diverted from its original and legitimate purpose.

After there is a central or principal institution put into successful operation, together with its experimental farm, then, and not till then, if Oxford, Athens, Delaware, Mt. Union, and other colleges, are willing to add a department of agriculture to be sustained out of the endowment fund, may they do so. For after the principal institution has been put into successful operation, then every institution of learning, which desires to disseminate the elements of agriculture as a science, should be encouraged to do so from any surplus fund which may arise from the endowment.

At the conclusion of the reading, the regular business of the Convention was proceeded with.

Mr. Waddle of Clark said: "Mr. Chairman, as it is the business of this Convention to elect members of the State Board, I move that nominations now be made, and that the election take place this evening."

The motion was put and carried.

Nominations were made as follows:

Geo. Pow of Mahoning county, J. P. Alexander of Summit county, M. M. Munson of Licking county, Daniel McMillen of Greene county, David Taylor of Franklin county, J. T. Reynolds of Erie county, Hayden W. Dooley of Preble county, R. R. Donnelly of Wayne county, Darwin E. Gardner of Lucas county, Jno. M. Millikin of Butler county, Solomon G. Brecount of Champaign county, James Buckingham of Muskingum county, Col. Messenger of Monroe county, W. H. Witter of Medina county, Giles Boalt of Huron county, Wm. R. Putnam of Washington county, J. W. Ross of Wood county.

Major Millikin of Butler withdrew his name, saying that he thought he had had his share of honors in this direction.

Mr. Gardner of Lucas alluded in feeling terms to his connection with the Board. He said that he had been favored by the Convention with a position in the Board for six years. During that time his associations with the members of the Board had been very pleasant, indeed, and a feeling so warm and earnest had grown up that he found it hard to sever his relations with them. Some of the members were then present; others were away, and two of them were in their graves. Those living had his warmest wishes for their success; and with them he could mourn the untimely loss of the dead, and cherish the sweet remembrance of their worth. Any gentleman might well be pleased with this recognition, but the position calls with it obligations and responsibilities from which he shrank. Besides, he had the precedent of abler and better men than he, who had uniformly declined. Following that precedent, and to make room for others who might be more useful to the State, he would most respectfully decline.

Mr. Putnam of Washington said that his associations with the Board had also been very pleasant, but his age and the remoteness of his residence from the Capital, would not enable him to give the business of the Board that attention it ought to have; therefore he would respectfully decline the nomination.

Mr. McLung of Miami moved that a committee of three be appointed to prepare business for the afternoon session, and that he be excused from serving on the committee.

Mr. McLung was not excused, and the chair named Messrs. McLung, Millikin and Gates as said committee.

On motion of Mr. Waddle, the Convention took a recess until two o'clock in the afternoon.

AFTERNOON SESSION.

Upon convening in the afternoon, the following resolution offered by Mr. McLung, was unanimously adopted:

Resolved, That the thanks of this Convention be presented to Mr. Klippart, for his paper, read this morning, and that the same, as containing valuable views upon the subject of agriculture, be published in the next annual report.

The committee on business, made the following report:

1. What action, if any, shall this Convention take upon the subject of the proposed college or colleges?
2. What is the value of the white willow for live fences?
3. Should not this Convention be hereafter held in December instead of January?
4. Should not the State Board offer premiums on classes of cattle?
5. To what depth should land be plowed, and should it be entirely reversed, or one edge lopped upon the previous furrow?
6. What system of farming is best—mixed husbandry, or confining operations to one branch of husbandry?

On motion the report was accepted.

Persons representing independent societies were invited to seats in the hall, and to take part in the discussions.

The first item of business—agricultural colleges—was then taken up, and on motion of Judge Jones, persons present representing colleges of the State, were invited to give their views in discussing this proposition.

Mr. McLung moved that that portion of the Governor's Message which relates to the agricultural land grant, be read, which was agreed to.

Major Millikin then read from the Governor's Message as suggested:

AGRICULTURAL LAND GRANT.

By enactment last winter you accepted the grant of land for agricultural education, made by act of Congress, approved July 2, 1862; of which I early notified the Interior Department at Washington. The whole correspondence relating to this subject is appended; from which it will be seen that the quantity of good land in the State subject to entry and appropriation under this grant was so small (only 80 acres) that I had no discretion but to elect to receive the amount in land scrip. Accordingly, on the 17th of September the commissioner forwarded to me three thousand nine hundred and thirty-seven certificates of scrip for "one-quarter section" each, equal to six hundred and thirty thousand acres; being in full for the claim of the State under the law. These certificates were deposited in the State Treasury, and the fund is subject to such further legislative action as you may deem proper.

No more important subject will claim your consideration than the proper disposition to be made of this grant. Mingled with the counsels of earnest and honest friends of education, you will, no doubt, find the pressure of local interests, the claims of existing institutions for additional endowment; and possibly some not entirely disinterested in their character. Among these it is no part of my duty, and I have certainly no inclination, to discriminate. The Commissioner of Common Schools has somewhat elaborately discussed the subject in his annual report. Without endorsing his views, I may be permitted to say that the clear and forcible manner in which they are presented may well commend them to your examination. He is evidently embarrassed by the question of local influences; and in endeavoring to conciliate them, falls into error, as I think, of so dividing up the income of the fund as to incapacitate either branch for performing what will be required of it, or the whole from achieving the usefulness that might, by concentrated effort, be accomplished. This is no less to be avoided, in my judgment, than the scheme so earnestly pressed by educational enthusiasts, of building up a grand institution whose professorships shall tempt the greatest scientific minds of the country —whose contribution to the grandeur of the State shall compensate for its utter want of utility—whose education shall illustrate and expand the abstruse theories of science, attainable by the few, but a sealed book to the many—whose lectures and publications, however appreciable by the highly educated mind, will be totally unintelligible to the honest tiller of the soil, who desires to learn, in the simplest and most practicable manner, how two blades of grass can be made to grow where only one was produced before.

The first thing to be determined is, what is the object or purpose of this grant? A careful examination of the act of Congress, it seems to me, very clearly solves this inquiry. The language of the law is, that the fund "shall be *inviolably* appropriated to the endowment, support and maintenance of at least one college, where the *leading object* shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and mechanic arts."

It is evident that the intention of the enactment is to institute a new and distinct species of education; one not heretofore favored, or specially encouraged, by State or National aid. It is also evident that the *purpose* to be accomplished is, the application of that instruction to the advancement of the agricultural and mechanic interests of the country. The great principle is recognized that all wealth comes from the earth, and the labor and mechanism requisite to produce it; and that whatever facilitates and increases the production, adds alike to individual and national wealth and greatness. Applying this principle to the law, it is manifest—

First—That this instruction is intended to be *sui generis*—of its own kind;—and that, although "scientific and classical studies" are not excluded, they are subordinated to "such branches of learning as are related to agriculture and the mechanic arts." In other words, it is the instruction of the industrial classes, within themselves, and in that *which pertains to their own callings*, in order that they may make practical and manual application of it, incidentally for their own benefit, but actually for the increase of national production and wealth.

Second—The instruction is to be plain and practical, not theoretic and artistically scientific in its character. And this, because, from the very nature of its purpose, it is designed to reach the greatest practicable number, with the rudiments of knowledge, instead of confining it to the few, in the long and tedious process of a collegiate and scientific education. For it is more important to the industrial interests, and consequently to the country, that one hundred men should receive instruction by plain and simple teaching, which they can practically apply in their respective branches of labor, than that one man should be educated to the highest point of scientific attainments.

Third—It is manifestly intended that this instruction so afforded, shall be reflected upon the great industrial interests it is designed to promote, and that its recipients, instead of becoming detached from laboring pursuits, will return to them, to make practical application of the learning they have acquired, and thus expand and improve the producing capacity and wealth of the country. We must not be lured from the practical by the theoretic; nor must we be deceived by the specious declaration of enthusiasts that this liberal donation is for the *general* education of the agricultural and mechanic classes. The avenues of general education are open to them at the present time, through a large number of public and private institutions. It is no part of the present object to detach men from the industrial pursuits, and educate them for the various learned professions. We have been doing that for over half a century; and as a result we have over-crowded the walks of the professions, lowered the standard of professional attainments and usefulness, stimulated and increased the non-producing classes, all the time overlooking and unheeding the education of the great body of producers in the knowledge pertaining to their pursuits in life, alike to their own benefit and the advantage of the State. The policy is, therefore, to provide education within, and pertaining to, the calling of the industrial classes, instead of compelling men to leave that calling, either to receive education, or, as a consequence thereupon, to abandon it. It is said we elevate men "by educating them from labor to higher callings and professions in life." If so, we can alike elevate the industrial classes, and benefit the country, by instructing them in the knowledge that pertains to their pursuits, in common with such general education as must necessarily be connected with it. What we have donated to us, for this special purpose, should not be extravagantly used, nor so appropriated as to confer its advantages upon the few, to the exclusion of the many. Those who have time and means to devote to classical studies have the opportunity afforded to them; but that is clearly rather an attachment to, than a feature in, the Congressional intendment.

Fourth—By the third stipulation of the fifth section the State is required, within five years, to provide at least one college for the purpose of this education. The ground may be purchased from the fund; but the erection or the maintenance of buildings can not be imposed upon it. Will the attachment of a professorship to an existing institution of learning fulfill this requirement? You must look to the fourth section for an answer to this interrogatory. The college there provided for must be one in which the "LEADING OBJECT"—or, in other words, the *paramount purpose*—shall be to "teach such branches of learning as are related to agriculture and the mechanic arts." This can not be subordinated to any other species of general education in such an institution. The establishment of a mere professorship, in order to carry a part or the whole of the endowment to an existing institution, can scarcely be held to be a fulfillment of an instruction so clearly expressed. That an existing institution may be adopted for this purpose is possible; but in such adoption its character must be entirely changed. It must become a college within the meaning of this law, where all other classes of education become subordinate to instruction in agriculture and the mechanic arts.

These are general views and suggestions occurring to me upon a careful examination of the law of Congress. I do not feel called upon to enforce them by further argument. I desire the prosperity and usefulness of our present institutions of learning; but if their endowments are not sufficient, let them be legitimately increased. If the Legislature has imposed burthens upon them for free education of any special class, let that be otherwise compensated; but let no doubtful powers be exercised, and no special trust be wrested from its purpose.

My attention is called to the phraseology of the act, that its provisions shall be carried into effect "in such manner as the Legislatures of the States shall respectively provide;" which, it is claimed, relieves the legislative body from any of the restrictions to which I have alluded, virtually making it a free donation, to be used at discretion. I do not concur in this construction. There is, of course, a reasonable discretion conferred by the language; but there is a general principle, which all must acknowledge, that in the administration of a trust, where the intendment is clear, it should be regarded as sacred by a legislative body, as it is made binding by law upon an individual. We may differ as to the construction and intentions of the law. My own opinion does not, of course, conclude, and need not influence yours; but to whatever conclusion you may arrive, I trust you will not, under the pressure, or in the conciliation of local influences, so weaken or impair the fund as to render it comparatively valueless The object of the appropriation, as I understand it, is a good one, and may be made a means of largely increasing the prosperity of the State. Too much should not be attempted with it in the beginning. Its application should be made gradually, affording opportunity for experience to demonstrate and correct any errors in the working of it. If applied to a separate institution, as I think it should be, I respectfully suggest that its management be entrusted to men of intelligence and integrity, practically associated with the interests it is designed to benefit.

In regard to the scrip, a suggestion was made, some time since, by the Governor of Massachusetts, that as many of the States in interest as practicable should agree upon a plan, and designate a common agent to manage the disposition of it, in order to prevent undue competition and reduction of values. I was favorably impressed with his views, but I had no authority to act in the matter, and so responded. I communicate the suggestion to you for such action as you may deem advisable.

When the reading was concluded, Col. S. D. Harris offered for adoption the following resolution:

Resolved, That we cordially approve the views of Gov. Brough on the subject of agricultural colleges, as expressed in his late message to the Legislature of Ohio.

Mr. Millikin. I suppose this resolution is offered to bring up the full consideration of the question?

Judge Jones. As Major Millikin is a representative of one of the principal seats of learning, let him speak to the resolution.

Col. Harris explained that the object he had in view in offering the resolution was to open debate. It was refreshing to him to find a paper coming from the executive of the State so practical as that. It had been unfashionable heretofore for the Governor of a State to give an opinion definitely on anything relating to agriculture. That interest was usually dismissed with a complimentary unmeaning phrase, this being thought all that was due to the farmers. And he was surprised on opening the Governor's message to find that he had struck the right base. The thoughtful and practical manner in which he treated this subject did Governor Brough credit. In conclusion, he hoped to hear from the professional gentlemen present on the subject.

Mr. McLung agreed with the views expressed by the Governor. At the same time he would like to hear the opinions of others, and it was not unlikely that, after having a full discussion of the subject, they might be able to come to some conclusion. He did not like to supersede the resolution offered by Col. Harris (which met his views), but he would offer another resolution, which would probably have to be considered as a substitute. He read as follows:

Resolved, That, in the opinion of this Convention, the object sought to be obtained by the grant of land from the General Government to the State of Ohio, will be better accomplished by one distinct college; and that in view thereof, this Convention respectully recommend to the General Assembly that they take such steps in framing a law as will accomplish that end.

Judge Jones remarked that considerable had been said as to what some of the existing colleges of the State desired in reference to this fund. It was referred to in the address of the Secretary, which was read in the morning, and there was an intimation of similar import in the Governor's message. Now he should like to hear their own views on the subject, and he hoped that Dr. Andrews, of Marietta College, and Prof. Merrick, of Delaware, whom he saw present, would address the Convention.

REMARKS OF DR. ANDREWS.

Dr. Andrews, President of Marietta College, responded to this invitation in a speech of some length.

He said that he wished it to be understood at the outset, that the college with which he was connected, had no claim on this grant. He had requested the Secretary to erase the name of Marietta College from the list embraced in the lecture to which they had listened in the morning. The trustees of that institution have never made a claim for a portion of that fund. For himself, connected with a college, and as a friend of education, he had thought largely upon this subject, and he had formed opinions as to the manner in which this grant should be disposed of, and of the influence it is likely to exert on the educational interests of the State. The first thing that will impress itself upon the mind of any one, is the entire discordance of opinions on this subject. The Governor alludes in his message, and takes exception to the positions assumed in the address of the Secretary and the report of School Commissioner; and he must confess that he was somewhat amused on hearing that resolution indorsing the Governor so broadly, after the unanimous vote of thanks to the Secretary. He had great respect for the Governor as the executive of the State, but could not indorse all his opinions on educational matters.

The value of six hundred and thirty thousand acres of land, given to the State for educational purposes, may be very great. Certainly the manner in which it shall be disposed of becomes a very important question, and it deserves the most thoughtful and careful consideration. The money may become of great importance to the State; it may be squandered, or it may become a positive detriment. No wonder the Auditor of State, in his report following the passage of the act of Congress, advised the General Assembly not to accept the grant. He clearly foresaw the great difficulties in the way of a compliance with the terms of the law; and then the money might be squandered; or it might prove of great harm to the educational interests of the State, in interfering with our school system. But the grant has been accepted, and the question, what is to be done with it? still remains.

No subject is more worthy of the close attention of the best people o the State than this. The Governor evidently does not believe in any general educational object. He does not believe any labor should be bestowed upon the higher sciences. Mr. Klippart believes the opposite. No two States have adopted the same plan in disposing of the grant. So we differ at the very outset. The reading of the act is that this grant shall be for the benefit of agriculture and the mechanic arts. The liberal construction is, that the framers of the bill intended to make it very broad and comprehensive. And here the speaker called attention to the fact, that while the words "practical" and "agriculture" were emphasized and explained by the Secretary, the words "liberal" and "mechanic arts" were not, or were overlooked. There is nothing more difficult to define than the word *practical*. In Cincinnati, a few years ago, a committee reported to the School Board in favor of two courses of study for the High Schools—the *classical* and the *practical*, thus assuming that the classical was not practical; yet, excepting the merest rudiments of Arithmetic, no study is more practical than that of the Latin. He believed that this grant was mainly for the benefit of the agricultural and mechanical interests, but not to be entirely absorbed in them, but, as the law says, those branches of learning *relating* to them shall also be taught. Now how shall the State of Ohio use the proceeds of this grant so that these interests shall best be benefitted? It is probable that the people of the State, devoted to agriculture and the mechanic arts, do want some sort of an institution which is their own, and he believed they had a right to claim it from the words of that grant. It had been said that the message did not indulge in the common place compliments to agriculture, usual with public men. After scanning it closely one would see that it was *not* complimentary to the agricultural classes, as it assumed that the merest modicum of knowledge was sufficient for them.

The question, as stated by those who had been heard, was, whether you should give agricultural people something practical, or whether you should make this the highest part of the system. Whether it is wise to hazard it all on an agricultural school is a question to be considered also. One thing is certain, that not a single agricultural college in this country has been successful. He believed the intelligent people of Ohio would not be satisfied that all should be risked on one great agricultural school, almost sure to fail. They must proceed with caution. There was no institution in the country which had met with great success, that had not founded that success upon small beginnings.

He regarded the position of the colleges of the State as simply this: They have no right to this grant, not a dollar of it. They are established for the promotion of general education; if they are good institutions they will get endowments; if not worthy, let them die. So far as the colleges were concerned, the question was not whether the grant could be used to increase their endowments, but whether the State could use them to advantage in carrying out the act of Congress. If they could be so used there was a claim upon them.

Now as to the *economy*. Every scheme that has been presented, proposes a central institution, and a high institution. How are the chairs of such an institution to be filled? The Secretary said, almost in so many words, that there was not a Professor in this country fit to fill a chair in such an institution. You want men of high attainments. But these cannot be secured without corresponding expenditures. Now the tuition of every student in the country *costs* from one to two hundred dollars a year, and he ventured to say that if Ohio invests as proposed, it will cost from $150 to $200. Then it is a question of serious import whether the State is ready to educate the sons of farmers at that expense.

A different plan had been proposed. Establish a central institution, and connect with it, if you please, an experimental farm. Have three or four professorships, and let them have the means of prosecuting investigations in the sciences. But they are to have nothing to do with raw boys, as their time is too important to be frittered away on those who ought to be in our common schools. Let the professors devote themselves to researches and experiments, and also to instructing those young men who wish to make high attainments. But all lower studies should be prosecuted in such existing institutions as may be employed for that purpose In this way the work could be more thoroughly done, and a great expense be saved the State. The Secretary says that the Agricultural College should be placed on a par with the professional schools of law, medicine, and theology. Nothing can be more true. Let this central institution be strictly a *professional* school, like the Cincinnati Law School, or the Starling Medical College. To expect that the whole education of one who intended to devote himself to agriculture, should be given in an agricultural college, would be as preposterous as to expect arithmetic to be taught in a law school, or geography in a medical college.

Allusion had been made to increasing the endowments of institutions. The Legislature had no right to do it from this grant. They might vote money out of the general treasury, but they could not vote this fund for the endowment of colleges. But suppose now, that for a portion of this money, they gave certain gratuitous education as preparatory for this central institution, and admitted, on examination, the best young men from the various counties of the State; would it not have a salutary influence upon the education of the State? You cannot afford to throw this labor and money away on the stupid ones. He did not fear, as the Governor seemed to, that any thing would be lost to the State by giving the youth of the rural districts the advantages of a higher education. He did not believe that because Salmon P. Chase had not remained a farmer all his life, or because our excellent Governor had not continued to handle types at the case, the country had lost any thing. In conclusion, the speaker said that if at the end of ten years this central institution should be found to be doing well, and the Legislature should decline to aid it further, there were plenty of wealthy men who would be willing to give it the requisite endowment. The rest of the proceeds of the grant might well be given to other institutions, not in the way of endowment, but to aid in carrying out the object of the grant.

Col. Harris made an explanation: Dr. Andrews was amused at a seeming antagonism between the action of the Convention in indorsing Secretary Klippart, and the resolution under consideration. He certainly could not see any very great occasion for amusement. The Convention could with perfect propriety compliment Mr. Klippart for reading an interesting essay, and also adopt the resolution he had offered.

Professor Merrick, of Delaware College, then addressed the Convention, taking ground very similar to that occupied by Dr. Andrews. He said that a false impression had been created in the minds of many in regard to the position of the colleges of the State towards this grant. The colleges are not about to engage in a scramble for this grant. It was doubtful whether most of them could afford to be connected with this enterprise; that it would cost more to afford the facilities required than they would realize from the grant. It was not supposed that if the Legislature selected any of these institutions upon which to bestow portions of this grant, they would select those unendowed. How should this important fund be made available to the classes intended to be benefitted by this appropriation? He was convinced that the best plan would be to establish a central institution, with branches in other institutions in the various sections of the State. In this way the fund will be made to go much farther, and better meet the objects of the act, than by the concentration of the proceeds of the grant in one single institution. Two or three of the institutions now existing may, with comparatively small addition, give the scientific instruction required to prepare young men for tranfer to the great central institution. They will need this preparatory training, and where can this be done so cheaply as in institutions already endowed? Many of the institutions of the State are even well prepared to give much of the "agricultural education" required; this is the case with the institution with which he is connected. It had been suggested that this plan would not meet the the terms of the law. He did not think so. These institutions may with propriety be considered as branches of the central institution.

Col. Connell of Fairfield was opposed to the resolution. He had from the first believed that when the people got the fund they would not know what to do with it. He knew there would be a general scramble for it.

He did not believe so much as some others in the immensity of the fund. We can talk of 630,000 acres of land, but when we come to sell them, we shall find the amount shrinking in importance. Land scrip was now out of the market, and even if they could be sold, speculators could obtain them at small prices. He thought there would not be enough to effect any very great object. He did not believe in an experimental farm established by this grant. The lawyer is not educated in Court, nor the physician in the sick chamber. It is the development of the intellect and the study of such sciences as pertain to certain professions that qualify young men for pursuing them. He thought the fund should be apportioned to the two State universities, which are now State property, that they may be converted into agricultural colleges.

Mr. Gates, of Lorain. "Will the gentleman name those institutions?"

Col. Connell. "I referred to the Ohio and Miami Universities."

Mr. McLung announced that the manuscript of the annual report of the School Commissioner had been received, and moved that that portion relating to the land grant be read. This was agreed to, and by request Mr. White read what he had written on the subject of agricultural education.

INDUSTRIAL COLLEGE.

The Legislature, at its last session, accepted the act of Congress "donating lands to the several States and Territories which may provide colleges for the benefit of agriculture and the mechanic arts," and pleged the faith of the State to the performance of all its conditions and provisions. The fulfillment of this pledge by the State, in its letter and spirit, is a grave duty—one that involves all our educational and industrial interests. It is evident that the introduction of so important an element into the educational system of the State, must affect that system beneficially or otherwise. This fact calls for and justifies a full discussion of the subject in this report.

The proper organization and direction of this great educational movement depends, in my judgment, upon the definite settlement of two fundamental questions, viz: 1. *What is the object Congress designed to secure by this munificent grant?* 2. *What course of study and instruction will best secure this object?*

Object of the Grant.

The object of this grant is clearly expressed in the 4th section of the act of Congress, which provides that all moneys derived from the sale of the lands donated shall be inviolably appropriated "to the endowment, support and maintenance of at least one college, where the LEADING OBJECT shall be, without excluding other scientific and classical studies, and including military tactics, *to teach such branches of learning as are related to agriculture and the mechanic arts,* in such manner as the Legislatures of the States may respectively prescribe, *in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life.*"

It is evident from this language that the "*leading* object" of this munificent grant by Congress is to provide the industrial classes with adequate facilities for acquiring a thorough and practical knowledge of "such branches of learning as are related to agriculture and the mechanic arts." All of the professions and leading pursuits, including law, medicine, theology, teaching, trade, and the army and navy, have each their special and exclusive means of instruction in the several branches related to them. The success of these professional schools long since settled the question of their importance and utility. They are regarded as necessary and dispensable agencies. But in this country, hitherto, agriculture and the mechanic arts, those great industrial pursuits that underlie all other professions, and which are so largely the practical embodiment of science, have been left without special educational facilities for their promotion and development. The industrial college, so liberally endowed by Congress, is designed to remedy this deficiency, and complete the circle of professional and special instruction. Its "leading object" is to meet this special educational want of industry, and the generous provision made by Congress to secure this end, appeals to the several States for an exhibition of like liberality and practical wisdom.

But the object of this grant is not simply to found colleges devoted exclusively to the special or "practical" education of the industrial classes. The act of Congress also makes provision for their "liberal" education, including a knowledge of "other scientific and classical studies." The *entire* object is to promote the liberal *and* practical education of the industrial classes. Whatever ambiguity may attach to the word "practical" here used, the meaning of the word "liberal" is definite and clear. The word "liberal," when used in connection with education, always has a definite, technical signification. A liberal education is an education in literature and the sciences generally, and is usually applied to a collegiate education. The fact that "other scientific and classical studies" are not to be excluded, shows that this is the meaning of the term as used in the act of Congress. The industrial college must furnish the industrial classes with facilities for acquiring a liberal as well as a practical education. Nothing less wide and thorough will meet the specific terms of the grant.

This evident construction of the law shows that the industrial college cannot be organized as a professional school exclusively on the plan of our medical, law, divinity, and commercial schools, nor even upon the plan of the Military Academy at West Point, in which all the studies are selected with reference to their bearing upon the practical duties of the military service—the classics and polite literature being entirely excluded from the course. It must include those general studies which may be requisite in the "liberal" education of the farmer and the mechanic, as well as those studies which have a more direct bearing upon the practical duties of their several pursuits. It is also equally clear that the industrial college cannot be made a *subordinate* department of a literary college. The "leading" object of the college—not of a department of some other college—must be professional instead of general education. In other words, general education in this institution is to be made *subordinate* to professional or special education.

Another object of this grant is evidently to extend the domain of the applied sciences by furnishing agriculture and the mechanic arts with adequate facilities for scientific experiment and investigation. The industrial college should discover new principles in science and art, and test, in a reliable manner, new applications and processes. Its experimental farms and gardens should determine with comparative accuracy the conditions of soil and climate requisite for the successful growth of the seeds and cuttings imported by the National Agricultural Department—experiments now often fruitless because they are not intelligently and skillfully conducted. It should, in brief, advance agriculture and the arts of industry, including mining, by the use of those special agencies with which it will be so amply endowed. All our material interests and resources should feel its influence.

In order that this grant may promote efficiently the "practical" education of the industrial classes, it should aid in the special training of the teachers of our common schools, so that they may be prepared to teach therein the primary facts of natural history, drawing, etc., and train their pupils to habits of observation and inquiry—instruction now sadly neglected for the want of such special preparation on the part of teachers. The normal or training school is a legitimate and important department of the industrial college.

Course of Study and Instruction.

In determining the course of instruction which should be provided for, the paramount question to be settled is this: What position in the course shall be given to general or liberal studies—these "other scientific and classical studies?" Upon this question there is great diversity of opinion, simply because there is a radical disagreement upon the great educational question which underlies it. Some claim that the course of instruction should include substantially the present curriculum of our colleges, with a special course of experimental instruction in agriculture and the mechanic arts superadded. Others ignore entirely all liberal education, and demand that the course shall be exclusively professional—a literary department being attached, if at all, as a useless ornament made necessary by the unhappy phraseology of the Congressional act. Still others who look upon the farmer and the artisan as mere "operatives" liable to be spoiled by too much education, insist that even the professional instruction imparted to them shall be restricted to the rudiments of such knowledge as can be practically applied in their respective pursuits. These views certainly differ very widely—the first making liberal education the chief work of the industrial college; the second virtually ignoring the value of such education as a necessary function of the college; and the third ignoring all thorough education, liberal or practical, and making the grand scope and purpose of the grant the wider diffusion of a few practical facts relating to agriculture and the mechanic arts.

But what is the plain and manifest meaning of the act of Congress? Evidently, as already shown, that the scheme of instruction shall be sufficiently wide and extensive to fill the full measure of a "liberal" as well as a professional education, but that the former shall be *subordinated* to the latter. The manner in which the subordination shall be effected is left to the Legislatures of the several States to determine, under the guidance of sound educational principles and the unequivocal teachings of experience. What are these principles and teachings?

Hon. Isaac Newton, Commissioner of the National Agricultural Department, has published an official exposition of the act of Congress donating lands, in which the liberal studies and the general discipline of the mental powers are made the *necessary basis* of the professional course of instruction. The following disconnected extracts fairly represent his views:

> "In the course of study in our few agricultural schools, and in the writings of those who have sought to mould public opinion, the instruction proposed has contemplated a preparation for the farm only. The languages have generally been regarded as useless, and the course of mathematical studies has been too limited. In this, we think, lies the failure of our agricultural colleges. Such limitation may be adapted to European affairs, where the son seeks to continue in the father's occupation. But here the farmer's son is no more destined to agricultural pursuits than the son of a professional man. * * The time is not yet come in the United States when the son will inherit the father's occupation. Nor is it desirable that it ever should be so. The eminent success of Americans in all the pursuits of life; the intellectual and physical energy they have displayed in them; the facility with which this intellect takes hold of the most diverse pursuits—all point to a condition so different, both mentally and socially, from the countries of Europe, that its agricultural schools furnish but an imperfect basis upon which to rear our own. We must mark out a path for ourselves.
>
> "Congress, in the act referred to, seems to have been governed by this American condition of things. Its provisions are broad and liberal. * * * * It will be seen from this that these colleges are not to be agricultural only. The education of the mechanic, manufacturer, merchant, and miner, is demanded as well as of the tiller of the soil. All the industrial classes are to be fitted for an intelligent career in the several pursuits

of life. Anything less broad would not have been equal justice to all. It requires, too, military instruction—that the citizen may be qualified for duties the discharge of which is now demanded of so many—and it does not exclude 'other scientific and classified studies.'

"Apart, then, from pre-eminent ability, we see that both in education and labor, a development of mental power is promoted by a general discipline of all the faculties of the mind, and that instruction dwarfed to a particular pursuit results in a dwarfed mind itself; that the powers of the mind, like those of the body, achieve most when their fully developed strength is centered, for the time, on the accomplishment of a certain object. If our greatest minds have found this developed strength in liberal studies, lesser minds must be governed by the same law of progress. Confine their faculties to a narrow routine of study and whilst a few faculties may be partially strengthened, others remain undeveloped.

"The purpose of an education is to teach men to observe and to think, these are alike essential to all pursuits, and in these operations of the mind all the faculties are called into requisition. A skillful and correct use of their power is the boon of instruction. Their general development is first to be accomplished, and subsequently this developed power is to be applied to particular pursuits. A course of instruction regarded merely as information is not less necessary to one pursuit than another; for a mere farmer or mechanic is not less to be discountenanced than a mere lawyer. General science and knowledge is as essential and is as becoming to the one as to the other. *All pursuits, then, may have a common course of instruction.*"

These views are eminently worthy of the source from which they emanate. They fully accord with those fundamental principles in education which sound philosophy and oft-repeated experiment have settled beyond dispute. All experience teaches that in the successful acquisition of those facts which have the greatest value in practical life, disciplined powers and developed strength are a pre-requisite. Every successful teacher will concur in the statement that the shortest road to a practical knowledge of applied science is through a mastery of the principles and laws of pure science. Many of the simplest questions of agriculture, for example, require for their intelligent solution a knowledge of branches of learning which apparently have no relation to practical agriculture. Besides, the student of agriculture, theoretical or practical, must bring to the task a mind trained to scientific investigation. It is true that such study will itself afford a degree of mental discipline, but there must also be developed strength as a necessary preparation for such study. The same fact holds true in all professional or special instruction. Hence it is that the discipline acquired in the thorough mastery of a study which has little apparent value in practical life, may be of the very greatest utility as a means of reaching those facts that are practically useful. Development thus becomes the gate-way to practical knowledge. No principle of education is better settled than this.

Here we find the reason for the failure of every attempt to educate youth for a given pursuit by ignoring the discipline of the mind. Such instruction inevitably, as Commissioner Newton well remarks, defeats itself. Practical facts to be practically available for safe guidance in any pursuit, must be thought out and made one's own, and then that such facts may be *applied* with certainty, there must be a clear insight into their causes, effects and relations. The superficial empiricist with a limited stock of disconnected facts, is constantly liable in every new use or application of his knowledge, to fall into error. He lacks the strength, self-balance, comprehension, grasp and inspiration which discipline and culture always impart to native powers. Hence, in every department of human endeavor, from the preparation of our daily food up to the guidance of a nation's affairs, what man most needs is a generous and full development of all his powers. The stuffing of immature and undisciplined minds with a superficial knowledge of such branches of learning as are popularly supposed to pertain to agriculture and the mechanic arts, would be the shammiest kind of an education—utterly unworthy of the dignity of the industrial classes and comparatively worthless as a means of their elevation and advancement.

But there is another view of this subject, higher and truer, than that of mere business utility. The great function of education is, in the language of Herbert Spencer, to teach man *how to live*—not how to live in the mere material sense only, but in the widest sense. Man does not live by bread alone. The farmer and the mechanic must also be a member of society, a citizen, a MAN. Upon him as well as upon other men, rests the responsibilities of life. The mightiest social and civil questions of earth's history demand solution at his hands. He may be called to the highest councils of the State or of the Nation—and well would it be for the country if he were oftener thus called. To this duty he should bring the same breadth of culture and comprehension as his compeers from the so-called learned professions. He should stand an honor to industry as well as her strong and able defender. The first step in all right education is to develop manhood—to educate man as *man* and not as an *instrument*—and any scheme of education for the industrial classes which ignores this great fact, which places a man's *occupation* above *himself*, will fail—in the future as in the past.

These principles make evident the practical wisdom of that provision of the Congressional grant which aims to secure the "liberal" education of the industrial classes as the necessary *basis* of their "practical" or professional education. In view of the fact that the general education of the farmer and the artizan is, to a good degree, already provided for, the leading object of the benefaction is special education, but great care is taken to make such special instruction fruitful and valuable by providing for and demanding needful preparatory training. Is it asked why special instruction was not made the sole function of the industrial college, and the necessary mental discipline made a condition of admission? To every practical educator the answer is evident. A portion of the special course must run parallel with the general course, or rather must be made a part of the general course. Existing colleges, on account of limited endowments, do not furnish adequate facilities for scientific study and investigation. Give to these colleges ample facilities for thorough instruction in the natural sciences and their more general applications, and there will then be no necessity of providing for general education in the industrial college. The course of instruction can then be made exclusively professional.

Plan of Organization.

Having determined the object or aim of the industrial college and the course of study to be provided for, we venture a few suggestions respecting the best plan of organizing such an institution.

Three plans have been proposed and more or less widely discussed:

1. It is proposed to establish a separate and independent institution, in which shall be taught all the higher branches of a scientific and classical education, with a school of military tactics, departments of agriculture, commerce, and the mechanic arts, and a large experimental farm.

It is claimed that this plan embodies the design and scope of the act of Congress.

2. A second plan proposed is to divide the grant between the two State Universities (Ohio and Miami), and to organize in each an agricultural and mechanical department.

3. Another plan is to divide the grant between a number of colleges, located in different parts of the State, and to organize in each an agricultural and mechanical department.

Without stopping to discuss the merits of these several plans, I wish to propose still another, which, in my judgment, combines largely the advantages of all the others, and promises higher success than either.

Inasmuch as the course of instruction naturally divides itself, as we have seen, into two courses—general or preparatory, and special or professional—I suggest that one-half of this fund be set apart for the establishment and endowment of a central institution of a professional character, including a school of military tactics, etc. The instruction in this department should deal largely with the applications of science, and should be, to a considerable extent, experimental. To this end a large experimental farm and the amplest means for scientific investigation, should be provided. As an incidental yet important feature of this department, full courses of practical lectures on agriculture and the mechanic arts might be given for the benefit of those engaged in these pursuits and unable to enter upon a full course of study.

The other half of the fund may be divided between say three well-endowed colleges, located in different parts of the State, and industrial departments, or departments of applied science, be organized in two of them, and a normal department in the third. The course of instruction in each of the branch industrial departments should be so arranged as to afford a thorough and complete preparation for the experimental study of agriculture and the mechanic arts. This preparation will include necessary mental culture and a thorough knowledge of the natural sciences, the elements of agricultural science, etc. As these colleges have well-endowed literary departments (pure science included), the necessary advantages in this direction would be already provided. Inasmuch as many industrial students would not be able to take a full literary and scientific course, provision for a more restricted or scientific course should be made. The three preparatory departments should be made *branches* of the central or experimental institution.

This plan manifestly embodies the design and scope of the act of Congress, and also strictly complies with all its provisions. The several departments, thus united, would form an industrial college in which the "*leading object*" would clearly be, "without excluding other scientific or classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts." It avoids the fatal error of *class* education—the assorting of our youth for the purposes of general education—which so far in this country has met with merited and signal failure, as the history of our farmers' colleges, agricultural schools, etc., fully attests. It harmonizes fully with our present educational system, and, at the same time, distributes the benefits of the grant more widely than the first or second plan above named.

The course of instruction in agriculture and the mechanic arts in each of the branch colleges will be as extensive and as practical as will be secured by dividing the entire grant between the two State Universities, or between three or four colleges. In neither case can these institutions, without losing in a measure their literary standing, manage an efficient experimental department, including an experimental farm, etc. It is impossible to make liberal education subordinate in either of the colleges of the State without driving from them those students—farmers' sons as well as others—who wish to secure a thorough education. Here is the secret of the failure of the few agricultural schools that have been organized in this country on the plan of uniting general and special education in the same course of study. Is it the part of wisdom to repeat these anti-American experiments?

The fact that the efficiency of the instruction in the branch departments will be compared in the examination of students for admission to the experimental department, will create a healthy rivalry and stimulate exertion to make the scientific or industrial course in each institution efficient and successful. Other colleges would find it for their interest to organize similar departments, thus insuring for the experimental course in the central department complete success.

Another advantage of the proposed plan is that it affords the State the necessary time for the sale of the land scrip and the organization of the central department. The selection of colleges in which to organise the branch departments might be made conditional. Such institutions might be required to raise the necessary funds to organize and carry forward the industrial course until the sale of the scrip can be effected. This would enable the State to get the industrial college in operation within the time fixed by Congress, without forcing the scrip upon the market. With proper care in the location of the lands, and in the sale of the scrip, the State ought to realize at least $630,000, or one dollar per acre. This sum invested in six per cent. United States stocks, or in State stocks, would yield an annual income of over $37,000—one half of which would amply endow the experimental school, and afford wide facilities for thorough scientific instruction and investigation. The other half would endow the scientific and agricultural chairs in the several branch departments.

Mr. McLung had hoped that the educational gentlemen present would take hold of this subject and talk in a plain way, but he had been disappointed. The dogma had been promulgated, that if you educate a man he was prepared for anything—for farming as well as for anything else. But the truth is, you can educate a man so thorough now-a-days as to drive all notions of farming out of him. Those men who come from college and attempt to farm, manage to get through the year with many dollars less. You may talk of theory, but practice is against it. He approved of the views of Dr. Andrews, urged in advocacy of one institution, and hoped that the necessary steps would be taken to establish it at an early day. He wanted a college that would be worthy of the State and of the great farming interests.

The speaker was glad to observe how very popular the subject of agricultural education was become all at once, and that so many had discovered that it was the essential thing for all our colleges. He was opposed, however, to giving this grant to institutions already worn out, and which are seeking a new lease of life. He was also opposed to the scheme of the School Commissioner, which was impracticable. It was bad policy to attempt to build up several institutions, when it is a mooted question whether they shall be able to realize enough out of this grant to take care of one college. In conclusion, he moved his resolution as a substitute for the one offered by Col. Harris. He did this simply because the proposition of Gov. Brough was negative in its character, and the least they could ask of the Legislature was the establishment of one institution in the State of Ohio.

Mr. Gates called for the reading of the original resolution and the substitute.

Following the reading, he proceeded to approve of the substitute. If the Convention expected to have any influence with the General Assembly, they must unite on some expression of opinion. Let them ask for a single central institution complete enough to carry out the object of the act of Congress. West Point was established to give young men a practical education in all branches, but especially in military science. All now see its importance, as a terrible civil war is being waged in the land. So we want a central college, the especial object of which shall be the education of young men for agricultural purposes. He had been raised a farmer. It was the only trade he ever learned thoroughly. He knew how to milk a cow, to underdrain land, and how to have a first-rate garden. He had in his family a friend, a classical scholar and thorough gentleman, but in all the practical things of this world he was the merest ninny that ever was, and if it had not been for some such practical body as himself, he might have starved by the wayside. [Laughter.]

The speaker had estimated the scrip, as the School Commissioner, at $630,000. With that they could buy a farm of 640 acres, upon which the experiments could be made. With this all that was necessary could be done. "In short," said Mr. Gates, "I'd plow and I'd mow, I'd reap and I'd sow. [Laughter.] Yes, I'd have goats and sheep, Herefords and Shorthorns. I would take in all the extremes."

Col. Harris. "Would you have dogs?" [Laughter.]

Mr. Gates. "No, I would not have dogs [laughter], but I'd have a good race course." [Renewed laughter.]

Judge T. C. Jones, of Delaware, concurred in the remark made by other gentlemen, that this subject was as difficult of a satisfactory solution as it is important to the great interest we represent here; and it is with hesitation and reluctance that I venture to participate in the debate. A Convention like this, whose session continues but a few hours, can hardly be expected to agree upon a plan for the execution of the trust imposed upon the State under this grant.

It is obvious that our first duty is to endeavor to ascertain the purpose specified in the act of Congress. This is a question of law, and in its investigation we are to be governed by the ordinary legal rules applicable to the construction of legislative acts.

Here is a trust fund donated by the United States to the State of Ohio, in trust, for certain purposes specified in the act of Congress. In administering this trust the State is bound in good faith to inquire what was the fair and obvious intention of the donor in making this grant. It is not for us to inquire whether the purpose stated in the act is the best or most judicious disposition that could have been made of this fund; wise or unwise, this purpose the State is bound to carry out in the execution of the trust.

Now, what is the language of the law? The proceeds of the land scrip are to be invested in stocks, and to constitute a perpetual fund, the interest of which shall be inviolably appropriated "to the endowment, support and maintenance of at least *one college*, where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts, in such manner as the Legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

In my humble judgment, this language settles most of the questions that have arisen as to the proper disposition of this fund. The State is to use the interest for the endowment, support and maintenance of at least one *college*—a word used to designate institutions of learning of the highest order—with full courses of instruction in the languages, sciences, &c. But the college that we are to endow must be one "where"—that is, at the college so endowed—"the *leading object* shall be, without excluding other scientific and classical studies," &c., "*to teach such branches of learning as are related to agriculture and the mechanic arts.*"

Of the existing colleges in the State, what one is there that fairly comes within this requirement? What one where the *leading object* is, to teach such branches as are related to agriculture and the mechanic arts? In all our existing *colleges*, the leading object is entirely a different object; nor do I believe that gentlemen in charge of these noble institutions will pretend that their leading object would be at all changed if a portion of this fund were added to their present endowments. They are institutions organized under special laws, which provide for the election of trustees and define their powers. Nearly all are controlled by some religious denomination, and portions of their endowments have been donated for the purpose of supporting denominational instruction. I have no idea that honorable gentlemen in charge of these colleges would desire to change these institutions from the purposes contemplated by those who contributed to their endowment, by organizing them into institutions to be controlled by no religious denomination, and where, instead of educating men for preachers and other learned professions, the *leading object* shall be to teach them such branches of learning as are related to agriculture and the mechanic arts; nor do I believe that any lawyer would pretend that they would have any *legal right* to make such change.

The two State institutions at Athens and Oxford, being endowed entirely by the State, it may be that the State would have the power to convert one or the other into a *new organization*, and create such an institution as the act of Congress contemplates. Whether this should be done if there be no legal difficulty in the way, depends upon the present condition of those institutions, the value of their property, the desirableness of the location, the probability of obtaining at fair prices lands adjoining, for an experimental farm, &c.

Mr. President, the American Congress in making this grant did not intend to provide for the support of a scientific department to be attached to existing colleges, or they would have told us so in the statute making the grant. The act, Sir, by the fair and obvious import of its words, provides for the establishment of colleges unlike any heretofore in existence either in America or in Europe—institutions where the ordinary instruction given at the best colleges shall be combined with such branches of learning as are related to agriculture and mechanic arts, "in order to promote the *liberal* and practical education of the industrial classes in the several pursuits and professions of life."

Congress no doubt was well aware of the fact that agricultural schools on the manual labor plan, had been failures, and that institutions where the sciences merely were taught without the "liberal" instruction, had not realized the anticipations of their founders; a new plan was therefore provided, embracing the liberal with the practical instruction. There can be no doubt but that institutions of this character would exert a powerful influence in elevating the condition of the industrial classes. We may expect the most enterprising and talented of our young men to enter these agricultural colleges, and while acquiring a knowledge of the branches ordinarily taught at the best universities would receive a practical instruction in the sciences related to agriculture. In the course of time we may expect this instruction to influence the character of our public men. A great agricultural State like Ohio, should produce statesmen who are familiar with that interest. In this respect the farming interests of Great Britain have a great advantage over the same interests with us. Members of Parliament there are generally landholders, and are familiar with all the operations of the farm and the agricultural resources of the country. In the southern portion of our own country, too, the statesmen and professional men have been instructed in all that relates to the growth and management of cotton, sugar and tobacco, as fully as in their professional pursuits. We can never expect the farmers of Ohio to have the influence in public affairs which the importance of the interest they represent should command, until our public men become practically acquainted with that interest—until they become familiar with the great products of the earth, which form the basis of our wealth and the power of our country.

In connection with the college the act provides you an experimental farm, without which it would be impossible to furnish the practical instruction contemplated. In this connection the speaker replied to the objection urged by Col. Connell; that students could not be taught farming as the practice of medicine is taught at medical colleges. There the student, by visiting hospitals and witnessing different diseases, dissections and surgical operations, is taught the application of the science of the profession. So here, while it is not expected that the manual labor of the farm will, to any considerable extent, be performed by the students, they will have an opportunity of witnessing all its operations, in connection with the lectures that will be delivered in illustration of all branches—plowing, preparing the ground, sowing the seed, harvesting, the composition and application of manures, stock raising, &c., &c. And I can see no reason why the student will not receive as much benefit from observing the practical application of the instruction here, as in the study of medicine and surgery.

In the present condition of the sciences supposed to be related to agriculture, as taught in existing colleges, candid men are compelled to admit that they afford but very little assistance to the former; but when these sciences are taught in connection with experiments, we may reasonably expect much more satisfactory results.

What shall we do with the propositions before us? By one of them we are asked to indorse the views stated by the Governor in his message. They are stated with great force and ability, and most of his suggestions are, I think, in accordance with what I have claimed to be the true construction of the act of Congress. But, as I understand the Governor, he does not favor the *liberal* in connection with the practical education. He seems to argue that the scientific and practical instruction will be sufficient. I have the same objection to the interesting paper read by our Secretary. Both look to the *mechanical* instruction of the mind, as if the student were to be prepared as a mere machine for the performance of a particular work. I have already attempted to show that the act of Congress, the deed trust under which we have accepted this grant, requires us to endow a *college* that shall promote the *liberal* education of the industrial classes; and I fully agree with what has been so well said by learned gentlemen here, representing different colleges, as to the importance of this instruction. Is a liberal course of instruction, such as is furnished by our highest institutions of learning, beneficial to professional men and to statesmen? If so, those who are to represent our industrial classes, the farmers and mechanics of the country, should have such instruction. We are required to provide means for imparting the highest and most liberal culture for our sons, such culture as will expand the mind and refine the taste, teaching what is beautiful in nature and excellent in morals. The apprehension that this high culture will tend to make the student proud and presumptuous, will "educate the farmer out of him," as has been said here, is, in my opinion, entirely groundless. The arrogant and dogmatical are generally imperfectly educated and ignorant, while the accomplished and thoroughly educated, having a due appreciation of the imperfection of the highest human attainments, are always unassuming and modest.

The great Webster, as thoroughly and liberally educated, perhaps, as any public man of his day, was familiar with all the operations of the farm, and directed the cultivation and management of his estate with as much skill as any farmer in New England. The same is true of Ohio's first statesman and jurist, Thomas Ewing, who for many years has been managing a large farm near Lancaster.

The speaker, therefore, advocated the adoption of the proposition offered by the gentleman from Miami (Mr. McLung), which, as afterwards modified by Mr. Gardner, recommends that the Legislature should take early and prudent steps to establish a college in accordance with the act of Congress. This, he believed, was all that this Convention should now attempt. If the Legislature should adopt the principle of dividing this fund, it would be found difficult to stop short of a general distribution to all the colleges in the State. And if local considerations, other than those which looked to securing a good and acceptable location, should be allowed to influence the Legislature, he was afraid they would have great difficulty in agreeing upon any plan for making the fund available for the purposes contemplated by Congress.

Mr. Gardner, of Lucas, remarked that two years ago this Board was called upon by Gov. Tod, to advise with him in regard to this matter, and yet no result had been reached. They had now the benefit of the Governor's message, the reports of the Secretary and of the Commissioner of Common Schools, and had been entertained by gentlemen who had devoted most of their lives to educational matters, and he was impressed with the weight and earnestness with which these various opinions had been urged.

[The Secretary, Mr. Klippart, here interrupted the speaker, to correct the idea thrust forward by Judge Jones, that he wanted to educate man as a machine. He did not think that man was to be educated because he was to be a *farmer* or a *weaver*, but he was to be educated because he was a MAN, and endowed with an immortal soul.]

The views of Judge Jones, it seemed to the speaker, expressed clearly their duty: that they should recommend to the Legislature the establishment, endowment and support of a college having for its object the liberal and practical education of the industrial classes of the community. This liberal and practical education is the combination of learning with art. He would not deny to those who follow the pursuit of agriculture the widest and noblest fields of intellectual research. They should be elevated by every influence and opportunity which could be afforded in such an institution in contemplation. And that was one of the reasons why he wanted such an institution established. He would not go beyond what seemed to be the plain and obvious meaning of the grant, which was to establish one or more colleges, the paramount object of which should be, as already explained, to teach agriculture and the mechanic arts. They must consider whether this could be effected in the selection of any of the institutions of learning in the State. They could not patronize them all. The speaker then named over a number of institutions, and added that for the Board to select either of them would be to discriminate unjustly against the others. But they were conducted on principles incompatible with the grant—incompatible with the paramount object had in view in the education of the industrial classes, and it was because they were incompatible that Congress had made this grant. Why was this so? It was because they were classical institutions. His circumstances in boyhood were such as to deprive him of these advantages, and on this account he had more clearly seen the difficulties in the way. From that time to this he had observed that the scholar engaged in manual labor was under a ban. He believed this to be the common experience of all the colleges in the United States, that the sons of farmers and mechanics could not enjoy the same advantages in them as the sons of parents of other classes. Whether the professors knew it or not, he thought he knew it, for he had felt it. Hence the principal object of the grant was to have a college which will afford facilities to the industrial classes in all departments of learning, such as are offered in the established institutions of the United States; and to such a college as that they expected their boys to go with a freedom they were denied in those already established and endowed. These, as he had before said, were devoted to one purpose—the education of youth for the learned professions—theology, law, medicine or literature. No student expected to devote his time and energies in after life to agriculture. That was excluded from the college. But it was for this purpose—to have an institution in which there shall be no such feeling of exclusiveness—that this college was intended.

The speaker thought it fortunate that this fund was not very large, or at present not very valuable. All the institutions that have succeeded in this country have come from small beginnings. So with all the great successes of life. It was better that they should be economical, careful, prudent, making a small beginning, so that if they failed (as certain gentlemen predicted) every thing would not be swamped. They should make such a limited investment at first as to run no risk of failure. And yet it might be that he was over-careful in that, as it was a saying among business men that it was a blessing for a young man to have at least one failure in his life. But, in looking to an humble beginning, they should invite from the industrial classes a few boys who should test this scheme, and if they succeeded they could in future make the institution what it should be.

Col. Harris remarked that he had been thinking for an hour or more what Mr. McLung meant by his substitute. It was upon another matter. If they approved of the sentiments of the message they could adopt the resolution, and then afterwards adopt the resolution offered by Mr. McLung, as it had reference to the details of the institution.

Maj. Millikin announced that Dr. G. V. Dorsey was present, and requested him to express his opinions on the subject.

REMARKS OF HON. G. VOLNEY DORSEY.

Doctor Dorsey said that he should not, in all probability, have troubled the Convention with any remarks, though he had been informed that the door had been generously opened to allow the friends of the various educational institutions of the State to present their views, had it not been for the inquiry proposed by Judge Jones, of Delaware: How far the existing institutions of the State could afford any material aid in carrying out the provisions of the Congressional grant and aiding the State in establishing Agricultural Colleges?

As a Trustee of Miami University for many years past, and thoroughly acquainted with her condition, her abilities and her wants, he desired to present her claims before the convention. In a memorial which he, in behalf of a committee of the two State Universities, had had the honor to present to the last Legislature, and which had been laid on the tables of the members of the convention, gentlemen would find his views on this subject to some extent embodied, but there were still other considerations which he would be glad to lay before them. And, in the very beginning, he wished to say that Miami University was not one of the "spavined institutions" to which some persons in and out of the convention had been pleased to refer, as asking a participation in the benefits of this grant, because in their crippled condition they were unable longer to go forward alone. Miami University asks nothing for which she is not prepared to give a full equivalent to the State, to the agricultural fund, and to the friends of Agricultural Colleges. As a literary institution, she stands among the first in the West, or indeed in the Union—her sons are scattered throughout the land, filling places of high trust in civil and military life, and every where doing honor to her name. In a material point of view, to answer more directly the questions which have been asked, she has buildings which have cost her $50,000, and which to-day could scarcely be put up for double that sum; she has a valuable chemical and philosophical apparatus, worth several thousands of dollars, which is immediately demanded in the course of instruction you require; she has 7,000 volumes of valuable books, $10,000 in cash, well invested, is free from debt, and has an annual income of over $6,000; she has professorships in which are already taught a large portion of those very branches of science which must necessarily enter into the education of the agricultural student. But why do I speak of the education of an agricultural student? Is not just the same course required to make an accomplished agriculturist—a farmer, if you please—as for a member of any other profession; I mean so far as the fundamental branches of learning are concerned. And here I beg leave to differ very materially with my excellent friend from Miami, who talks about "educating all the farmer out of a man." Sir, the thing is impossible; you can no more educate the farmer out of a man than you can educate the lawyer or the physician out of a man. There is no part or branch of learning which may not become useful to the accomplished farmer as to the accomplished gentleman in any pursuit in life. We have heard long enough about the education proper for a farmer. The education proper for a farmer is what is proper for any other well-informed and thoroughly educated man, and the nearer he approaches to a thoroughly educated man, the nearer is he to a perfect agriculturist.

But it is said there are certain branches of knowledge peculiarly fitted for the farmer. True; and what are these? Chemistry, as applied to minerals and soils, animal chemistry, animal and vegetable anatomy and physiology, botany, zoology, etc.; all of which are even now more or less taught in all our best colleges, and should be more carefully taught, and will be so when we unite to our Universities a college in which "the leading object shall be," in the words of this Congressional grant, "to teach such branches of learning as are related to agriculture and the mechanic arts." And is there anything incompatible with the nature and duties of a University in attaching to it such a college? Assuredly not. It has been done in all parts of the civilized world, and these are the only successful Agricultural Colleges in existence; when attempted to be made to stand alone they have uniformly failed, but under the protection and with the aid of proper literary institutions have been almost uniformly successful. The reason is obvious; all learning is, to some extent, a unit, and every part is dependent on some other part and must receive aid and support from it. Our Universities were intended to embrace colleges of every description, for law, medicine, natural science and agriculture, and all else which may contribute to the improvement and well-being of men; and until they do this they fall short of the great object for which they have been founded in the State.

But to return—what do we gain for the agricultural college by its union with Miami University? Not only this literary support, without which I have endeavored to show you it cannot stand, but yet far more. Gentlemen talk here very calmly about purchasing sites and erecting suitable buildings, and preparing necessary apparatus for setting in action these agricultural colleges. Ah! gentlemen, read the second clause of the fifth section of the act of Congress: "No portion of said fund nor the interest thereon shall be applied, directly nor indirectly, under any pretense whatever, to the purchase, erection, preservation or repair of any building or buildings." That is broad and it is explicit—unless you desire to put your hands into the treasury of the State, and draw therefrom in the first place a hundred thousand dollars or more to erect proper buildings, and forever after to continue to draw therefrom for their preservation and repair, you must look to some source whence these necessary expenditures can come, and where so readily as from an institution which has buildings and an income which can be at once devoted to their enlargement and preservation, while the accruing interest of your fund can be applied to the more full and liberal endowment of those professorships immediately connected with the peculiar branches to be taught, remembering always that the very words of the grant provide that these shall be taught, "without excluding other scientific and classical studies," which you find ready to your hand in the other chairs of our Institution.

These things are to be taught in "such manner as the legislatures of the States may respectively prescribe, in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life." The views enunciated by the grant are highly liberal, and evince a conviction of the necessity of uniting all the branches of liberal knowledge in the founding of a proper agricultural school. Let us carry out the provisions of the grant in an equally liberal manner, and in founding these institutions display a spirit worthy of the age and the interests of the people of this great State. Do we really appreciate how much agriculture, this great mother of wealth, owes to science and to the improvements in almost every branch of human learning? I need not stop to speak of the improvements in machinery, by which the labors of the husbandman are so much diminished, while the returns from his labor are so largely augmented, but I ask you to look at other and less easily perceivable advantages, though not less real. The improvements in chemistry have been year by year showing us the value of particular manures and fertilizers for all the different varieties of soil, and thousands are every day using these improvements and deriving advantages from them, who know little of the source from which they have sprung. But I am told that a knowledge of the chemical composition of a particular soil or a particular manure, does not instruct us with certainty as to its effects on the growth and culture of particular grains or grasses, or plants. True, no doubt, to a certain extent. Nor does the knowledge of the chemical composition of any particular medicine inform the physician precisely how it will act on the human system as a remedial agent; yet we do not for this reason reject the aid which we can derive from chemical analysis. A union of just theory with careful practice is the only means of attaining excellence in any branch of knowledge or any profession of life, and it is as true in agriculture as in anything else.

But I go on to examine how we are to use this grant given us by Congress. We have to-day in the State Treasury this land scrip for 630,000 acres of land. This is to be disposed of on the best possible terms, and the proceeds to be invested so as to produce not less than five per cent. on the amount invested. The capital produced from the sale of this scrip is to remain forever undiminished, and for the safety and preservation of this capital the State is held responsible, so that if by "any action or contingency it shall be diminished or lost, it shall be replaced by the State to which it belongs." Now in order to secure the State against all possibility of loss from this source, I would deem it advisable to place this fund in the irreducible debt of the State, on which we pay six per centum per annum, payable semi-annually.

If this scrip produces $630,000, we can take up so much of our foreign or domestic debt, on which we are paying the same interest, and pay this interest for the benefit of those who are yearly growing up to be the rulers and directors of the State. In this way the capital fund is forever rendered secure to the State, and the interest can be applied as the Legislature in its wisdom may direct. The Trustees of Miami University are appointed by the State authorities, and are subject to their control. It is entirely competent for these authorities to direct the manner in which the connection is to be formed and carried out between this institution or any other State institution and the colleges founded under this grant. If we realize some thirty or thirty-six thousand dollars from the annual interest of this fund, then, it has seemed to me, that one-half of this amount paid over to each of the two State Universities, Ohio and Miami, would enable them, under the direction of the Legislature, to connect with these institutions, Agricultural Colleges, where the leading object should be to teach such branches of learning as "are related to agriculture and the mechanic arts." Fifteen or eighteen thousand dollars per annum added to the present income of these institutions, would enable them to give great advantages to all classes of students, and become at once an honor and an ornament to the State. Attached to each of these let us have a model farm where, when the proper theory has been acquired, the practical results of agriculture can also be seen and practiced. This is as necessary to the profession of agriculture as the clinique or the hospital is to the student of medicine, or the moot-court to the student of law. This union, then, of these institutions, both of which must be under the control of the State, presents not only no conflicting features, but is full of advantages on every side. It has been so considered in other States. Rhode Island has given, by legislative action, her share of this Congressional grant to Brown University; Connecticut, to Yale; Massachusetts, the mother of our school system, to Amherst; and we have thus an example set before us worthy of imitation and of respect.

The interest of the State in this grant is too great to be trifled with; the interest of the people in the results to spring from its use is too important to permit us to determine on any plan without the most careful and cautious examination. This Convention can have much weight with the Legislature, and we trust the united wisdom of all connected with both these bodies, will be exerted to give proper direction to the action which is to be commenced. In the few remarks I have made, I have been actuated only by an earnest desire to see this fund so used and expended as to produce the greatest possible benefit to the "industrial classes," which I hold to include almost every one in the State, "in the several pursuits and professions of life."

Mr. McLung would say nothing further on the merits of the question under discussion, but reply briefly to a remark made by Dr. Dorsey. He had, when up before, spoken in regard to practical education in contradistinction to the literary education as taught at Miami University. It was simply ridiculous for these literary gentlemen to say that they could teach agriculturists the principle and practice of farming. Gentlemen may have the theory without the practice, and if they were sent out to put into practice their theory—to plant corn for instance—they would plant the corn six or eight inches below the surface of the ground as likely as more shallow [laughter]. Practically their education is neglected. That is what they were to look after, and it was very evident that what they wanted could not be obtained through broken-down institutions—institutions that had thus far entirely neglected what this grant intended to promote.

On motion of Mr. Waddle, the Convention took a recess until seven o'clock, P. M.

EVENING SESSION.

On motion of Judge Jones, the Convention proceeded to elect five members of the State Board, to act for two years.

The Chair appointed as tellers, Messrs. Forseman, of Franklin, and Linton, of Clinton.

The name of Col. Messenger was withdrawn.

The vote was taken, with the following result:

D. McMillen, of Greene county	44	votes.
David Taylor, of Franklin county	44	"
R. R. Donnelly, of Wayne county	28	"
James Buckingham, of Muskingum county	37	"
J. W. Ross, of Wood county	36	"
Geo. Pow, of Mahoning county	11	"
M. M. Munson, of Licking county	1	"
J. P. Alexander, of Summit county	7	"
I. T. Reynolds, of Erie county	4	"
H. W. Dooly, of Preble county	1	"

Sol. G. Brecount, of Champaign county	1 vote.
W. H. Witter, of Medina county	4 "
Giles Boalt, of Huron county	5 "

Messrs. McMillen, Taylor, Donnelly, Buckingham and Ross, having received a majority of the votes cast, were declared duly elected.

CONTINUATION OF DISCUSSION ON RESOLUTION.

Judge Newton, of Mahoning county, continued the discussion on the resolution relative to the land grant. He said that he had been for the last fifty years an advocate of farming, and was the first man in Washington to advocate the establishment of an agricultural bureau. He had bestowed some attention to the act of Congress under consideration, since last winter. It would be his object, in the remarks he should make, to express what he thought the farmers wished and desired. He thought that they wanted an independent college of their own. They did not want the grant divided so as to fritter away the great object had in view in its creation. As to the standard of education, they need not discuss that at present. When the question of the establishment of the Smithsonian Institute was before Congress, the language of Smithson was the subject of great controversy. The words were: "I give so much for the increase and diffusion of knowledge among men." It was claimed that extending knowledge was to give more knowledge than before. Prof. Henry, who was one of the most learned men in this country, held that the intention of the donor would be best subserved in confining the labors of the institution to making new discoveries and establishing and publishing new facts; not in making more plain what was before established. He finally brought the public mind to that point. Prof. Henry having economized the funds so closely that the Smithsonian Institute has been made the subject of admiration over the whole world. Now, farmers want something of the kind established here, which shall increase knowledge in the science of agriculture, and become a standard for the whole world. The draughtsman never intended to have the term "liberal education" applied to that which was liberal years ago, but liberal in discovering something new, and in that which conduces to the expanding of the mind of the student. It is lamentable that the education of farmers has been kept at so low a standard in this country. The difficulty, the speaker apprehended, would be in applying the fund practically and economically; the danger was that they would enlarge it too much, they would have too large a farm and too many professors.

In conclusion, he said that it would be an advantage to him who might be called upon to exercise the functions of a legislator on this subject, to have an expression of opinion of the Convention.

Mr. Gardner asked the Chair to state the question.

The Chairman read the resolution as introduced by Col. Harris.

Mr. Gardner inquired of Col. Harris if he intended to press that resolution?

Col. Harris replied that he had not pressed the question. He thought the majority of the Convention would concur in the resolution. The proposition was plain, and did not need an argument. He was perfectly willing to trust the views of Gov. Brough in the hands of the Convention.

Mr. Gardner said that he was much rejoiced at the interest manifested by the Governor in this matter, and he admired the ability with which the subject was discussed in his message. But the discussion in the Convention had evinced a difference of opinion among gentlemen, and as the General Assembly would be called on to take action on the subject, he thought it best to let each proposition stand upon its own merits. In his opinion, neither the Governor, the Commissioner, Mr. Klippart, nor the learned professors who had addressed them, needed the endorsement of the Convention. They were assured that the General Assembly were now willing to receive the opinion of the Convention as to the disposal of the land grant, and they ought not to delay that expression of opinion when they had a right to be heard in this matter. He had therefore prepared a resolution, as expressing in the simplest form the views of the Convention, which he read, as follows:

Resolved, That the General Assembly is requested to take early and prudent steps for the establishment of a college for the benefit of agriculture and the mechanic arts, pursuant to the act of Congress of July 2d, 1862.

Col. Harris said that he was not satisfied that they were ready to take action on this subject. He was not sure that they had any fund to proceed in this enterprise. If any gentleman had any delicacy about voting against his resolution on the ground that they would thereby vote against Gov. Brough, then he was willing to withdraw his resolution. For his own part he saw no necessity for consulting policy in this matter. It was made the Governor's duty to bring to the attention of the General Assembly any subject requiring legislative action, and it was in compliance with this duty, and in this spirit, that the Governor had presented the question of the disposal of the agricultural land grant in his message. The plain, business-like and common-sense manner in which the Governor had discussed the subject, received his approval, and it was altogether proper for the Board to indorse the Governor's views if members concurred therein. He would, however, withdraw the resolution.

Judge Jones spoke of the necessity of early action on this subject. The grant provides that unless the State takes definite action for the establishment of a college within five years, the land reverts back to the General Government. As the act passed Congress in 1862, there are only about two years left us in which to consider the question.

Maj. Millikin addressed the Convention on Mr. Gardner's resolution. There had been a good deal said about the wishes and desires of the agricultural interests of the country, and about the intention and purpose of the drawer of this bill providing for the establishment of agricultural colleges in the several States. Now this was all very well as mere speculations, and the views of gentlemen thus presented are worthy of consideration. But there were matters worthy of consideration not yet presented. He had heard with great interest, and pleasure too, the views presented by the gentlemen representing the colleges of Marietta and Delaware, and although he had a high respect for these gentlemen, yet, in his opinion, the views presented by them did not meet the object of this law at all. Their scheme was, that the different colleges should have professorships for the interests under consideration, and from these the students should be sent up to a central institution, where they should receive a higher education in agriculture and the mechanic arts. Now, if that view is the correct one, where is the college at which classical learning, agriculture and the mechanic arts are taught as contemplated in the grant? Will it be at Marietta, at Delaware, at Oxford, or at this central institution? It could not be at all of them, for he did not suppose these institutions would ignore their organization. This could not be. The plain and obvious meaning of the law is, that everything connected with science, everything connected with arts, everything connected with mechanic arts, shall be taught at one institution, and in connection therewith military tactics shall be taught. Any arrangement that might be made would require all these to be complied with. This might be done with a central institution. But there was one practical question to be considered: Was there any possibility of establishing one institution in any portion of the State of Ohio, disconnected from any of the established institutions, within the two and a half years allowed to comply with the terms of the grant? Was it likely that the Legislature would appropriate the necessary amount of funds to establish, within the two and a half years, *just* the college provided for under this grant? He thought it clear that there was not a remote probability of that being done. It would be a very ruinous policy on the part of the Legislature to attempt to do any such thing. If the question were the loss of the grant or the appropriation of one hundred thousand dollars, in his opinion the Legislature would decide in favor of the former. He certainly did not think it proper for that body to make any such appropriation. No good, careful business man would now engage in the erection of buildings for such a purpose.

Now as to another proposition. What does Miami University teach there that could not be required to be taught according to the requirements of this law? What then is needed? To add to this everything pertaining to agriculture and the mechanic arts, and in addition military tactics. Now what could Miami University do? With buildings sufficient for any such school, with ninety acres of land, and with ten thousand dollars on hand, she could inaugurate an agricultural college within a period of ten months. There would be no necessity of withdrawing a single dollar from the grant. Such professors as were necessary could be appointed at once. Then was there not a practicable means by which this fund could be secured without taxing the people of the State? He did not think it expedient to rely on the people of Ohio to establish one independent institution, and if this was not done, then the grant would be lost. This seemed to him a practical question, and one that should meet the endorsement of the Convention. Was this Convention prepared to present a distinctive opinion to the General Assembly? They had come there at ten o'clock, and had discussed the matter most of the time during the day; but he questioned very much whether the Legislature would adopt the opinions of the Convention so hastily made up. He would offer the following amendment to Mr. Gardner's resolution:

Resolved, That it is inexpedient for this Convention to express any hasty and immature opinions as to the best mode of appropriating the funds granted by Congress for educational purposes.

Mr. Gardner. The question was discussed last year, when Major Millikin did not attend, in the presence of the General Assembly. It had been made the subject of various discussions in the newspapers; and he could hardly think this body was unprepared to give an expression to their opinions, and to endorse the resolution. The resolution expressed the opinion only that it was important that the General Assembly should take early measures to establish an agricultural college. The substitute was that they should suspend an expression of opinion on this subject. It certainly was unfortunate if, after having availed themselves of three years, they could not now express an opinion on this subject! He trusted that the Convention would adopt the resolution, and that within the five years allowed by Congress they might be able to see successfully inaugurated an agricultural college, whether at Oxford, Columbus or Cleveland, it did not matter. He certainly should be glad if at Oxford, or any where else in the State, they should be able to find an institution furnished to their hands. The resolution left this matter open and free for the Legislature to do that which it deemed the best. It was, that they should take early measures for the establishment of an institution of this kind. It did not become them to express anything less on that occasion. It had been his policy to guard against dictating a policy to the Legislature; but the time had come when, to make good the action already taken, it was necessary to establish an institution of this kind.

Major Millikin said that he had misapprehended the scope of the resolution, and he therefore asked leave to withdraw the substitute.

Leave was granted; and a vote being taken on the resolution, it was adopted unanimously.

FINANCIAL.

Mr. McMillen called for the reading of the financial report.

The Secretary then read as follows:

Treasurer's Statement.

Cash on hand at last settlement	$9,676 07
" from Treasurer of State	3,822 75
" " Columbus subscription	5,000 00
" " interest on 5-20 U. S. Bonds	222 28
" " premium on 5-20 U. S. Bonds	500 00
" receipts from Fair	12,621 07
	$31,842 17

Disbursements.

Paid Ohio Pomological Society	$300 00	
" premiums of 1863	558 00	
" claims due from 1863	1,358 57	
" office expense	385 30	
" express and postage	249 67	
" printing and advertising	1,075 15	
" marshals, superintendents and police	1,066 90	
" lumber, labor and fixtures	13,052 79	
" premiums of 1864	3,653 12	
" sundry expenses	524 48	
" J. H. Klippart, salary	1,500 00	
" premiums on 5-20's	210 00	
Cash on hand	7,909 19	
		$31,842 17

Aside from the $7,909.19 cash on hand, the Board owns the lumber and fixtures on the grounds, which are worth at least some $6,000 or $7,000, thus showing the condition of the Society to be sounder financially than ever before.

WHITE WILLOWS FOR LIVE FENCES.

On motion of Mr. McMillen, the second subject was then taken up, as follows:

"What is the value of the white willow for live fences?"

Col. Harris called for Mr. George Anderson, of Lake county.

[Mr. Anderson spoke on the subject, but his remarks were made in so low a tone of voice as to be almost inaudible where the reporter sat. From a few words caught here and there, the reporter got the impression that the speaker was in favor of white willow for live fences, but that he had not experimented much with it himself. His description of the manner of setting out and lopping off, could not be heard distinctly.]

Mr. Cowan had no knowledge of the subject.

Mr. McMillen gave as an excuse for taking up the time of the Convention in discussing this subject, was to explode this latest humbug. He had had some hedging, and he confessed that it was one of the greatest humbugs on his farm. He had the pleasure of setting out some eighty rods of this for nothing, last spring. We have the experience of older countries against live fences. The farmers of England are now offering prizes to those who will destroy the greatest amount in one year.

Mr. Jamison, of Harrison county, said, in the township where he resided much interest was manifested in the subject. Fifty thousand plants were sold there last year, and if it was good for nothing, the people would like to know it.

Mr. Gates inquired where the white willow was obtained.

Mr. Greer spoke of the observations of Mr. Pike, who, in his remarks on the subject to which he had listened, made reference to one place where the white willow was procured, but he did not succeed in enliciting any definite information when they were received. Mr. Pike had said great frauds were perpetrated.

Mr. Anderson said, in the township of Perry, Geauga county, on the farm of Mr. Watts, there were fences of different growth, which promised well. But in Medina county, near where he lived, they had exceeded the expectations of the people. When the size of a walking-stick the plants are placed in the ground, and when they grew about two or three feet high, they were then cut off. He replied sharply to the charge that live fences were humbugs. In reply to the question, he said the white willow was an upland willow, and therefore it was extremely valuable.

Mr. McMillen replied, that the planting of fences to grow, and to live for the lifetime of a man, was all very well in theory, but quite a different thing in practice. To grow a hedge it was necessary to have it trimmed twice a year, and how much this labor was worth, any one who had tried it could tell. Besides the plant is exhausting to the soil, and it is impossible to plant within three feet of it. In short, in his opinion, if a man lived fifty years, he would save money and labor by using the common rail fence.

Mr. Klippart asked how the leaf of the white willow compared with our common weeping willow.

Mr. Anderson said that it had a long leaf. As to trimming, Mr. McMillen was wrong. By cutting it early, you dwarfed it, and after that there was but little trouble in keeping it trimmed. When a fence is six years old, you could cut off the limbs with a corn cutter, without inconvenience, and these limbs may be made valuable. In Philadelphia they are used for wicker work. One dealer alone there has paid over six thousand dollars in one year for these limbs. If the white willow required as much expense to trim as the osage orange, then he would admit that it would not pay; but it did not.

Mr. Klippart said he had no disposition to cry "humbug" about anything he knew nothing about. There were two law suits now pending in the courts which will settle the question whether there is any such thing as white willow for sale here. What he had to say was, that the white willow did not grow indigenous to the United States. We have had surveys made for the purposes of investigation, and it was found out that there was no such plant in this country; and at the custom-houses, we could find no entry of white willow cuttings. It was his opinion, that in the United States there were about a dozen willows that will answer the purpose of the white willow.

TIME OF HOLDING CONVENTION.

The third subject was then taken up as follows:

"Should not this Convention be held hereafter in December instead of January?"

Col. Harris said all were pretty well agreed on this subject. At first the convention had met on the third Wednesday of December, but some gentlemen being anxious to meet with the Legislature, got the thing changed. But experience had proven that they were in the way of the Legislature, and the Legislature in their way, and he thought it had better be changed back to the old custom.

Mr. Gates suggested that they ought to vote on this subject; but some one calling for the reading of the next topic, it was read as follows by the Secretary:

"Should not the State Board offer premiums on classes of cattle?"

Mr. Gates offered the following resolution on the subject:

Resolved, That the Ohio State Board of Agriculture be instructed, in arranging their premium list for the next annual fair, to offer premiums for classes in cattle.

By request, this was withdrawn, to permit Col. Harris to present the following resolution:

Resolved, That the Legislature of Ohio be requested to change the time of meeting of the State Board of Agriculture to the first Wednesday after the first Monday in December.

Mr. Gardner. This question had been up every year since he had been a member of the Board, and the opinion had been thus far against the change. What new reasons there were to be urged in favor of the change he should like to hear from Mr. Harris. The time of meeting of the Convention had been changed on account of the change in the time of meeting of the General Assembly. During this meeting of the Convention, he had heard members find fault and indulge in language that was disrespectful, if it had been taken seriously. The General Assembly had treated them with kindness and courtesy. Many of their members had been glad to meet with members of the Legislature. Another expression he had heard was, that legislators had interfered with the affairs of the Convention. On the contrary, they had had nothing to do with it, except by request of their own County Societies. Moreover, much that the Convention had to do was connected with the legislation of the State, and it was proper that there should be a conference between the members of the two bodies. The city of Columbus was pleasanter to visit when the Legislature was in session, as at other seasons of the year it was not a desirable place to visit. Six years ago they met in a cold and disagreeable hall across the street, now they were accommodated with a comfortable and beautiful chamber in which to hold their sessions. He hoped that hereafter they should continue as they had been doing, and that they should have pleasant intercourse with members of the General Assembly.

Mr. McLung said that the law was repealed at the solicitation of Mr. Hughes of Butler county, on the plea that they would have a better attendance by the change. If members would reflect a moment, they would recollect that until the present season, they had had very slight attendance. The object had in view by the change had not been accomplished, but on the contrary it had been defeated. Because there were members of the Legislature in the city, the proper representatives of the County Societies, had neglected to come up. So far as intercourse with the Legislature was concerned, it had been most pleasant; but he had heard it said that members did not like to be disturbed in their legislation, and that it was asking too much of them to give up their chamber to the Convention. But another objection he had to urge was, that one day did not afford them sufficient time to discuss the questions of interest that came before them, and they were usually compelled to leave many of these propositions undecided. He was in favor of the change, that they might be better able to promote the interests of agriculture thereby.

Mr. Gardner stated that he had been informed by a person who understood these things, that the carpet of the Senate Chamber was always taken up after the adjournment of the General Assembly, and kept up until near the time of meeting of the Legislature again. In fact, the Hall was not fit for occupancy until prepared for the use of the General Assembly. Hence it was to the interest, as being more convenient, for the Convention to meet as had of late years been the custom. And then all attempts made to consume more than one day in Convention had always failed. The delegates did not like to spend more time away from their business.

Mr. Gates also opposed a change. The vote being taken on the passage of the resolution, the chair announced that it was lost.

PREMIUMS ON CLASSES OF CATTLE.

Mr. Gates again called up his resolution to instruct the State Board, in arranging their premium list for the next annual fair, to offer premiums on classes of cattle.

Mr. Waddle asked for an explanation.

Mr. Gates responded. He meant by classes of cattle, first Short Horns, next Herefords, next Devons, next Ayreshires, and, if the gentleman pleased, next Pennyroyal cattle. [Laughter.] At the Lorain County Fair they offered a premium for every kind of cattle, and the result was that they always had a good cattle show. But the system adopted and carried out by the State Board for the last two or three years, had run the thing into the ground. When we go round to examine the stock, we find a few royal Short Horns. [Laughter.] Many persons who attended the State Fair last season, and who also visited the Lorain County Fair, said that there were more in number at the County Fair than at the State Fair. They had Short Horns, Devons, without number, and Herefords—they used to have Ayreshires, but they had *evaporated*—gone to Cincinnati, probably, where they belonged. [Laughter.] He had concluded that work cattle had gone out of existence; but at their fair one man came up with three pair of Devon work cattle, so large and well made, it did one's eyes good to look upon

A voice. "Don't we offer premiums for work cattle?"

Mr. Gates. Yes, but not for Devon work cattle. For beef, Herefords were the best. In the British meat market, Short Horns stand No. 4, and John Bull is a judge of beef. [Laughter.] He goes to our neighboring States and gets liberal premiums, but he never comes to Ohio, for the State Board have ruled Herefords out. In conclusion Mr. Gates said that the State Fair would run down if the Board continued to restrict the premium list.

Mr. Waddle replied he had had a little discussion with that gentleman (referring to Mr. Gates) on this subject last winter. [Laughter.] He thought the Board had a very proper ruling on this matter now. They give a premium on the *best* cattle. Then why does not Mr. Aston come up with his Hereford cattle? When he was in attendance on the Fair, as members of the Board well remembered, he took more premiums than his cattle were worth. Then he went to Indiana, where he played the same game, but finally his Hereford had evaporated like the Ayreshire. [Laughter.] Now, he had calculated that the Board had paid a premium of $20 for every

Ayreshire exhibited, $20 for every Hereford, and but $1.23 for every Shorthorn. But Mr. Gates had said to the Board, "Fill up your stalls." Well, let Mr. Aston come with his Herefords; they would not occupy much space, certainly not many stalls, as he had never presented more than two. [Laughter.)

Mr. Gates. "*Two?*" [Renewed laughter.]

Mr. Waddle repeated the number, and added that he had heard of some Hungarian cattle in Lorain county. For his part, he considered Shorthorns best for beef, best for milk and best for work, and he did not know what else they would want them for.

Mr. Gates replied sharply. He was astonished that gentlemen would adhere to that one breed of cattle. He knew that Mr. Waddle was a Shorthorn man—that he had always been a Shorthorn man—and in fact that he had Shorthorn on the brain. [Laughter.] He had asked why Mr. Aston did not exhibit his Herefords. There was one difficulty in the way, which gentlemen themselves must confess was a serious one, and which was well stated by Mr. Aston. Mr. A. said that the State Board put Shorthorn men on the committees, and when it came to the test Hereford men stood no more chance than a short-tail stag in fly time. [Laughter.] But why not make this distinction in sheep?

Mr. Waddle stated that he believed the State Board had two classes of cattle at one time at Cleveland. In the first class were Shorthorns and Herefords; in the second Ayreshire and Devons. The gentleman from Lorain (Mr. Gates) was then on the committee. Did his friend Aston then produce his Herefords? [Laughter.]

Mr. Gates said, in reply, that it was true he was on the committee, but it was a Shorthorn committee [laughter,] and he was then on a royal committee for the first time in his life. But he thought the gentleman must be mistaken, for if he were in the right Old Tom Aston would certainly have been there. [Laughter.]

Mr. Anderson coincided with Mr. Gates. It was best to fill the stalls at a fair, and if this was not done they would run out.

A vote was taken on the resolution, and the chair announced that the resolution was adopted.

PREMIUMS ON WOOL.

Mr. Broome, of Guernsey county, offered the following resolution:

Resolved, That this convention request the State Board of Agriculture to offer liberal premiums for the heaviest fleeces of cleansed wool.

Mr. Broome remarked, in support of his resolution, that they were, as sheep men, inclined to go somewhat to extremes. The great rage seemed to be for heavy shearers. He was in favor of that himself, but we were having too much wool. The Vermont sheep did not cleanse as much as our heavy shearers. He had thought it best to have as much wool mixed with the dirt as possible.

The resolution was adopted.

PLOWING LAND.

The Secretary then read the fifth subject, as follows:

"To what depth should land be plowed, and should it be entirely reversed, or one edge lopped upon the previous furrow?"

Mr. Anderson said that his experience was in favor of plowing deep, turning the land flat, in rich soil; thin land so that it would lie on edge. In plowing stiff soil, the Michigan Double Plow seemed to take the lead.

TIME FOR HOLDING ELECTIONS, ETC.

Pending action on the above resolution, the Secretary read the last subject; but Mr. Linton, of Clinton, having the floor, he offered the following resolution:

Resolved, That the time for holding elections for County and District Boards be changed from January to the middle of September.

Mr. Linton said he thought it better for the farmers to travel from home to elect a board of officers in September than in January.

Major Millikin considered the subject within the province of the Board, and that the reasons they had in framing the rules were very conclusive. It was intended to require the retiring officers to make their report of the operations of the fair in their respective counties, to the Board at the close of the year, and immediately thereafter it was expected that another board of officers would be organized to attend to matters for the succeeding year. Certainly the farmers have more time in January than in September.

Col. Harris said that he had been requested by several county societies to bring the subject before the Board. They claimed that it was much more convenient to have their election at the time of holding the fair. If the matter was delayed until January, it was difficult to get together a respectable number of the members of the society. He did not suppose that the rule was adhered to throughout the State. There were societies which held their election in September or May just as it suited their convenience. The *time* of electing officers was not so important; as a general thing the report could be closed up, and the outgoing officers could just as well represent the society until the new officers took their places, in May or September just as well as if elected in January. Upon the whole he had concluded that the interests of the society would be better subserved, if this matter were left entirely to the discretion and choice of a majority of its members.

Mr. Brightman, of Huron county, spoke of the difficulty of having elections uniform in time, as the day that might best suit one society, might be very inconvenient for another society. The counties embraced in his agricultural district had each a separate day on which the election was held. Still he was of the opinion that there ought to be some general rule, and elections held at all places at the same time. He had never heard any complaint in his section of the manner in which the business was conducted.

Mr. Waddle stated the reasons governing the Board in the adoption of that rule. At the time of holding a fair in any one county there were many persons from other counties, who might without much inconvenience vote. There were then great fears expressed by some of the best friends of agriculture, that their fairs would be mere exhibitions of trotting stock. It was proposed at one time to require each person to pay two dollars for the privilege of voting, but after due consideration of the subject, it was thought best to change the time as the most effectual method of preventing interference. There was another reason: By having the election at the time of the fair the new officers might not take the pains to make a report to this body.

Major Millikin moved to lay the subject on the table, which was agreed to.

HUSBANDRY.

The next proposition was then called up by Mr. McMillan, as follows:

"What system of farming is best—mixed husbandry, or confining operations to one branch of husbandry?"

Major Millikin wanted Mr. McMillan to justify himself; or to explain to the Convention, how he excused himself for devoting his farm to Shorthorns? [Laughter.]

Mr. McMillan. It was a prevalent idea that one could take up any subject and proceed. In the business of merchandizing, however, they would find that one person takes up groceries, another dry goods, and so on, each one making himself familiar with its duties and making a profit. And it seemed to him, that by giving one's attention wholly to one class or business, as in his own case, in raising Shorthorns, farming would be in no ways injured, but benefited. Instances of this kind were afforded in the old countries, where farming was brought to more perfection than here. There was Richard Boothe, whose attention was wholly given to Shorthorns, who obtained complete success. He believed that at any time he could have obtained for his best animal, as much as for an entire herd in this country. This proved the advantage of devoting one's attention entirely to one subject.

Major Millikin said it was all very well for the gentleman to get up and advocate concentration of efforts on one subject, when it suited his convenience. But was it not the safest policy to gentlemen engaged in agriculture to adopt a mixed policy? He could see how Mr. McMillen, by breeding all cattle, might increase the productive capacity of his farm for general farming, after he gets through with the stock business. He would enrich his farm and make it more productive. He considered that they were apt to run too much into graining farms, or into raising grain. Now a man ought to keep enough of stock to consume the fodder and to make manure for his land.

PREMIUMS ON SHEEP.

The following resolutions were offered:

Resolved, That the State Board be requested to consider the propriety of offering more liberal premiums on sheep, and of classifying foreign and home bred.

Resolved, That they be also requested to offer larger premiums on agricultural implements.

A vote was taken on the resolutions, and decided in the affirmative.

Judge Jones suggested that the question was not fairly understood, and that gentlemen had voted under a misapprehension. Was it intended by the resolution to say that more liberal premiums should be given to *all* classes of sheep? If that were done then the relative proportion of premiums on sheep would be greater than on all other classes of stock. If gentlemen would take the matter into consideration, they would hardly make such a positive recommendation.

Major Millikin moved a reconsideration of the vote, which was carried.

Mr. Greer said that fault was found in the matter by exhibiters from other States.

Mr. Millikin objected earnestly to the word "*foreign*" in the resolution, as applying to other States; it was unpatriotic and ought not to be tolerated by the Convention. Were the States petty principalities, or were they merely parts of a great nation? We recognize nothing foreign that appertains to the welfare of any portion of the country. He moved to lay the resolutions on the table. Carried.

COUNTY ELECTIONS.

Mr. Rawle, of Lucas county, offered the following resolution:

Resolved, That we recommend the State Board so to change the rule in relation to county elections that the time of holding be discretionary with the members of each society.

Maj. Millikin asked if this had not been embraced virtually in a former resolution?

The Chair decided that the point of order was not well taken, as the widest latitude had been given to debate on this subject.

Mr. Rawle said that he had opposed the first resolution, because it stated a definite time. It would be better left discretionary, as it would be more convenient in some counties to elect one time and in others at another time.

Mr. Brightman replied that if the time were left as proposed, in many counties there would be no election. Who was there to give notice? Who to be responsible? They had enough to do now, under the present rule, to elect officers and keep up the organization. If this resolution prevail, in many small towns it would be the business of no one in particular to attend to the matter.

Mr. Linton ventured to say a word or two in behalf of those who had sent him to the convention. The delegates were sent here to make laws and regulate agricultural societies, and it was their duty to make such regulations as would best accommodate their societies. The rule fixed the day of election in the month of January: could not the managers of the societies as well fix the day? His County Board made their own regulations. Their people did not like to be dragged out in the winter time, and the old men who have sons in the army could not well leave their cattle-feeding and everything else to go up and take part in the proceedings of the society.

Maj. Millikin said that gentleman labored under a great misapprehension to suppose that it was the province of the convention to make rules for the regulation and government of county societies; that belonged to the Board. The reasons stated by Mr. Waddle were very cogent, and ought to be satisfactory. One in particular he would repeat: that the outgoing Presidents ought to make the reports to this society.

Col. Harris said that he was sorry to differ from his friend from Butler. They were there to aid the State Board of Agriculture of Ohio, and it was their province to legislate on the business of agriculture; and it was competent and proper for them to decide what was to the interest of the county societies.

Maj. Millikin corrected Col. Harris.

Mr. Gates again spoke against the proposition, and the question being put it was lost.

On motion of Maj. Millikin, the Convention adjourned *sine die.*

OHIO STATE FAIR FOR 1864.

The Fifteenth Annual Fair of the Ohio State Board of Agriculture was held in Stewart's Grove, one mile south of the State House, in the city of Columbus, on Tuesday, September 13th, and closed on Friday afternoon, September 16th, 1864.

The city of Columbus is, beyond successful controversy, the most accessible city in the State of Ohio. There are eighty-eight (88) counties in the State, and the facilities for reaching Columbus are now such, that persons leaving any county in the State in the morning may be in Columbus in the evening of the same day. Military causes have verified this statement frequently during the past three years.

Columbus is connected with the following points, viz:

With Cleveland, by the C. C. and C. R. R., distant 134 miles; time, 4 hours 30 minutes.

With Cincinnati, by Little Miami, Columbus and Xenia R. R., 130, miles; time, 4 hours 10 minutes.

With Dayton, by Columbus and Xenia and C. H. and D. R. R., 71 miles; time, 3 hours 5 minutes.

With Pittsburg, by Pittsburg, Columbus and Cincinnati R. R., 219 miles; time, 10 hours.

With Wheeling, by Central Ohio R. R., 140 miles; time, 6 hours 40 minutes.

With Toledo, by C. C. and C. and Cleveland and Toledo, 200 miles; time, 8 hours 30 minutes.

With Indianapolis, by Piqua and Columbus, 185 miles; time, 8 hours 45 minutes.

With Sandusky, by C. C. and C., Sandusky, Mansfield and Newark, 113 miles; time, 4 hours 50 minutes.

With Marietta, by Central Ohio and Muskingum River.

These railways, and their connections, afford facilities from every part of the State to reach Columbus from 5 to 10 hours by express trains.

Being the Capital of the State, there are as a matter of necessity many public buildings, which of themselves may well repay a visit to the city. Within the corporate limits of the city are the State Arsenal, Lunatic Asylum, Deaf and Dumb Asylum, Asylum for the Blind, and one for Idiots. The Penitentiary, another large and well-finished building, is just within the city limits. Last and not least is the Capitol building, the grandest and most substantial State building in the Union—a structure which has cost about a million and half of dollars to complete.

The city is very pleasantly located on the east bank of the Scioto—has wide and well-paved streets. The accommodations for visitors were fully as ample as in any other city of the State. During the past three years several hundred new residences have been built.

The location of the Fair was in a beautiful grove of stately forest trees, situated at the southern extremity of High street, and reached by the street cars from the railroad depot. There was abundance of those grateful luxuries—so very desirable on a fair ground—shade and water.

The most enviable record which the people of Ohio are making for themselves during the existence of the gigantic and unholy rebellion which is now devastating the land, is the fact, that notwithstanding Ohio has sent fully 250,000 of her sons of toil to the suppression of the rebellion, in various capacities, yet all the industrial resources appear to be undisturbed. Apparently there is not a single acre less of land cultivated than in 1860; nor have any of the mechanical departments been suspended, but, on the contrary, every agricultural implement manufacturing establishment, of any note, has for once in the history of the country been unable to supply the demand for their manufactures. This great demand for agricultural implements is in a great degree due to the influence of agricultural fairs, where at county agricultural fairs thousands, and at State fairs, scores of thousands of visitors see and examine the implements and machines on exhibition, and now when the time of need avail themselves of the information acquired at the fairs, and supply their wants accordingly.

ENTRIES OF THOROUGHBRED CATTLE.

1.	Hill & Jones,	Delaware,	bull.	Buckeye Starlight, 4 years old, red roan.
2.	same	do	heifer,	Cambria, 2 yrs, red roan.
3.	same	do	“	Star Maria, 2 yrs, red.
4.	same	do	“	Idaho, 2 yrs, red.
5.	same	do	“	Starlight's Beauty, 2 yrs, roan.
6.	same	do	“	Nellie Grey, calf, red.
7.	same	do	“	Sharon Lass, calf, red roan.
8.	John F. Ijams,	Columbus,	bull,	Invincible, 1 yr, red.
9.	same	do	cow,	Clinton Bell, 5 yrs, roan.
10.	same	do	heifer,	Beauty, 2 yrs, “
11.	same	do	“	Nellie, calf
12.	Jared Forsman,	do	bull,	Zorolter or Gov. Tod, 1 yr.
13.	John Inslow,	Springfield,	bull,	Grand Duke of Oxford, 3 yrs.
14.	D. McMillan,	Xenia,	bull,	Gen. Grant, 2 yrs.
15.	same	do	“	Miami Duke, 1 yr.
16.	same	do	“	calf, 10 mos.
17.	same	do	“	“ Othello, 8 mos.
18.	same	do	“	“ 7 mos.
	same	do	cow,	Duchess of Oakland, 3 yrs.
				, Lady Fairy 8th, 2 yrs.

21. D. McMillan, Xenia, heifer, Carrie Watson, 1 yr.
22. same do " calf, Jessie 2d, 3 mos.
23. James Kinniard, Columbus, cow, Peacock, 5 yrs.
24. same do " Anna Clark, 3 yrs.
25. same do heifer calf, Fanny Fern.
26. A. J. & W. S. & W. A. Powell, Reynoldsburg, bull, Washington's Day, 4 yrs.
27. same do " Challenger, 1 yr.
28. same do " calf.
29. same do cow, Fanny, 3 yrs.
30. same do " Lily, 2 yrs.
31. same do " Martha Washington, 2 yrs.
32. same do " May Flower, 2 yrs.
33. same do heifer, Ellen, 1 yr.
34. C. M. Clark, Springfield, bull, Duke of Clark, 2 yrs.
35. same do " Gen. Grant, 1 yr.
36. same do cow, Lady of Clark, 1 yr.
37. same do " Anna Hunt, 4 yrs.
38. same do " Flora Bell, 5 yrs.
39. same do bull calf, Gen. Butler, 7 mos.
40. same do heifer, Lady Franklin, 5 mos.
41. G. M. Coulter, Reeceville, cow, Peach Blossom, 5 yrs.
42. same do " Queen Victoria, 5 yrs.
43. same do " Emma, 6 yrs.
44. same do " Moss Rose, 7 yrs.
45. G. C. Palmer, do heifer, White Rose, 1 yr.

AWARDS ON THOROUGHBRED CATTLE.

Males.

Hill & Jones, Delaware, Buckeye Starlight, best bull, 3 yrs old and upwards	$50
John Iuslow, Springfield, Grand Duke of Oxford, 2d best do, " "	30
D. McMillan, Xenia, Gen Grant, best bull, 2 yrs old and under 3	30
C M. Clark, Springfield, Duke of Clark, 2d best do, " "	20
D. McMillan, Xenia, Miami Duke, best bull, 1 yr old and under 2	25
C. M. Clark, Springfield, Gen. Grant, 2d best do, " "	15
D. McMillan, Xenia, best bull calf	10
C. M. Clark, Springfield, Gen. Butler, 2d best do	5

Females.

C. M. Clark, Springfield, Flora Bell, best cow, 3 yrs old and upwards	$50
D. McMillan, Xenia, Duchess of Oakland, 2d best do, " "	30
Same do Lady Fairy 8th, best cow, 2 yrs old and under 3	30
Hill & Jones, Delaware, Starlight's Beauty, 2d best do, " "	20
C. M. Clark, Springfield, Lady of Clark, best heifer, 1 yr old and under 2	25
D. McMillan, Xenia, Carrie Watson, 2d best do, " "	15
Hill & Jones, Delaware, Nelly Grey, best heifer calf	10
C. M. Clark, Springfield, Lady of Franklin, 2d best do	5

PEDIGREE OF PRIZE ANIMALS.

GENERAL GRANT. 4825.

Red. Calved March 10th, 1862.

	General Grant	By Imp. Starlight	(12416)	1003
1st.	Jessie	Starlight 2d		2959

2d.	Fancy	Mario	683½
3d.	Imp. Stapleton Lass	Sailor	(9592)
4th.	———	Liverpool	(8227)
5th.	———	Matchless	(4427)
6th.	———	Run back to Barmpton	(52)

MIAMI DUKE 5007.

Red and white. Calved October 11th, 1862.

	Miami Duke	By Duke of Thorndale	2787
1st.	Sunbeam	Colonel	350
2d.	Dundenna	White Comet	1090
3d.	Rose	Imp. Comet	356
4th.	Young Caroline	Symmetry	(5382)
5th.	Caroline	Dashwood	———
6th.	Fanny	Stockstry	———

2D DUCHESS OF OAKLAND.

Roan. Calved June 9th, 1861

	2d Duchess of Oakland	By Duke of Thorndale	2787
1st.	Sunbeam	Imp. Colonel	350
2d.	Dundenna	White Comet	1093
3d.	Rose	Imp. Comet	356
4th.	Young Caroline	Imp. Symmetry	(5385)
5th.	Caroline	Dashwood	———
6th.	Fanny	Stockstry	———
7th.	———	Senator	(1427)
8th.	———	Whitefoot	———
9th.	Rosina	Aid-de-Camp	(722)

LADY FAIRY 8TH.

Red and white. Bred by William Warfield, Lexington, Ky. Calved March 22d, 1862.

	Lady Fairy 8th	By Loudon Duke	3097
1st.	Lady Fairy 4th	St. Lawrence	(12037)
2d.	Lady Fairy 2d	Imp. Young Chilton	(11287)
3d.	Imp. Lady Fairy	Laudable	(9282)
4th.	Fairy Tale	Sir Thomas Fairfax	(5196)
5th.	Thomasine	Stillington	(5327)
6th.	———	Young Rockingham	(2547)
7th.	———	Driver	(1928)
8th.	———	Richard	(1376)

CARRIE WATSON.

Roan. Calved December 5th, 1862.

	Carrie Watson	By Belted Knight	3667
1st.	Lady Watson	By Imp. Billy Harrison	263
2d.	Lady Jane	Whittington	(12299)
3d.	Lady Brown	Lord Lowther	(7164)
4th.	Eliza	Panton Favorite	(4646)
5th.	Eliza	A son of Grazier	(1085)
6th.	Elizabeth	A son of Grazier	(1085)
7th.	Bessy	Vulcan	(8746)
8th.	Bessy	Quaker	(1349)

BUCKEYE STARLIGHT. 3718.

Red roan. Bred by Jas. Fullington, Esq., Union Co., O. Calved February 20th, 1860.

Got by imported Starlight, (12146); dam imported Stapleton Lass, by Sailor, (9592); g. dam ———, by Liverpool, (8227); g. g. dam Cherry, by Matchless, (4427); g. g. g. dam Beauty, by Young Barmpton, (3089); g. g. g. g. dam ———, by Young Eryholme, (1981); g. g. g. g. g. dam ———, by Thorp, (1515); g. g. g. g. g. g. dam ———, by Yorkshireman, (708); ——— by Bolingbroke (86); ——— by Punch, (531).

STARLIGHT'S BEAUTY.

Roan. Calved February, 1862.

Got by Buckeye Starlight, 3718; dam Beauty 5th, by Master Winfield, 1854; g. dam Beauty 3d, by imported Master Belleville, (11795); g. g. dam Beauty 2d, by Sterling, 1004; g. g. g. dam Beauty, by Shakespeare, (12062); g. g. g. g. dam ———, by imported Prince Charles, (2461).

NELLIE GREY.

Red with little white. Calved 1864.

Got by Count Starlight, 4678; dam Charlotte Grey, by Romeo, 3380; g. dam Alice Grey, by Rover, 931; g. g. dam Grace Darling, by Kleber, (4165); ——— Victoria, by Don Juan, 430; ——— Britannia, imported by Hon. Henry Clay in 1835, and bred by Mr. Charge, Darlington, Durham, England.

Nellie Grey was winner of the first prize at the Ohio State Fair in 1864, and at the Delaware Co. Fair the same year.

FLORA BELL.

Roan. Bred by R. G. Corwin, Lebanon, O.; the property of C. M. Clark, Springfield, O. Calved October 16, 1858.

Got by New-Year's Day (13383) out of the Scottish Blue Bell, by Capt. Shaftoe, (6833); Daisy by Tomboy, (5494); ——— by Priam, (4758). Cora, a thoroughbred cow, sold at Mr. Denton's sale to Mr. Wetherell, Yorkshire, England.

ENTRIES OF FAT CATTLE AND MILCH COWS.

1. R. Baker, Avon, O., milch cow, Lizzie (thoroughbred), 3 years old.
2. same do " Empress, ⅞ Durham, 9 yrs.
3. Zadoc Vesey, Columbus, steer, Isaac, 2 yrs, white.
4. same do " Duke, 2 yrs, roan.
5. D. McMillan, Xenia, cow, Prize Flower, 9 yrs, roan
6. Saml. Stimmel, Columbus, fat bullock, Davy Tod, 5 yrs.
7. J. G. Coulter, Reeceville, steer, Winger, 5 yrs.
8. G. M. Coulter, do cow, Victoria, 5 yrs.
9. Reed & Stroup, London, fat cow, 7 yrs.
10. James Thomas, Franklinton, milch cow, Net of America, 9 yrs.
11. same do " Sally, 8 yrs.

AWARDS ON FAT CATTLE AND MILCH COWS.

No entries in work oxen and steers.

Fat Cattle.

J. G. Coulter, Reeceville, Winger, best single bullock, 4 yrs old and upwards........	$30
Saml. Stimmel, Columbus, Davy Tod, 2d best " " "	20
Zadoc Vesey, Columbus, Duke, best fat steer, 2 yrs old and under 3................	20
Same do Isaac, 2d best " " "	10

Reed & Stroup, London, best fat cow or heifer	$20
D. McMillan, Xenia, Prize Flower, 2d best do	10

Milch Cows.

R. Baker, Avon, Lizzie, best milch cow of any age or breed	25
Same do Empress, 2d best " " "	15

Report of Committee on Single Bullock, 4 years old and upwards.—The committee for this class was organized on Thursday, and commenced their examination same day. They are sorry to say they found no entries on exhibition under the head of "Work Oxen and Steers."

In table "Single Bullock, 4 years old and upwards," two entries were made—Winger, a red or cherry bullock, aged 5 years, by J. S. Coulter; and Davy Tod, a roan bullock, aged 7 years, by Saml. Stimmel. The red bullock, being the youngest, we adjudged to be the smaller, and perhaps the lightest animal, but for the firmness of texture and the development of muscle, or meat, at the more desirable points, we gave him the preference. We adjudged the greater weight, with the same superficies, to the red bullock; the roan develbped as great amount of fat as the other, but not so well laid on. Both were very superior bullocks, and are to be highly commended; they speak well for the beef-feeding interest of the State.

The exhibition in this class, though small, was made up by its superior excellence. After a full examination, we awarded the first premium to J. G. Coulter, and the second to Saml. Stimmel.

Report of Committee on Steers, 2 years old and under 3.—Two entries were made in this class, both by Zadock Vesey, Columbus, O. The steers were good June or grass beef, nothing more. Good breeding was, however, apparent. The lack of fat made your committee reluctant, while the breeding compelled the committee to give the first and second premiums to the two steers.

REPORT OF COMMITTEE ON FAT COW OR HEIFER.

There were three entries made in this class of three fat cows: one owned by D. McMillan, Xenia, one by G. M. Coulter, Reeceville, and one by Reed & Stroup, London.

Two of the cows were very good fat animals, and the committee with but slight preference awarded the first premium to Reed & Stroup, the second to D. McMillen. The cow shown by G. M. Coulter was a well-bred animal, but not so fat as to demand a further commendation or notice.

REPORT OF COMMITTEE ON MILCH COWS.

Four entries were made in this class, but there were but two cows presented to your committee. These were Empress, 9 years old, by R. Baker, Avon, O., and Lizzie, 3 years old.

The statements we appended of the amount of milk given and of the butter rendered, were in the hands of the committee. After a thorough examination of the cows and of the butter, the committee was quite ready and unanimous in giving both premiums offered in the list—the first to Lizzie, the younger, and the second to Empress, the older cow. We would add that Lizzie is a thoroughbred Shorthorn, and gives the lie to the too commonly expressed opinion that Durhams are not good for milking, Mr. Baker on this breeding has evidently shown a desire to develop milking qualities, rather than of growth or development of meat or muscle. Here was a scientific principle in cattle rearing made apparent by Mr. Baker, worthy the attention and consideration of our readers.

ELIJAH BEMISS,
ERASTUS SPENCER,
M. M. MUNSON.

ENTRIES IN SWEEPSTAKES—CATTLE.

1. Hill & Jones, Delaware, bull Buckeye Starlight, 4 years old, red roan, with 5 calves, viz: Cambria, 2 years old, red roan; Star Maria, 2 years old, red; Idaho, 2 years old, red; Starlight's Beauty, 2 years old, roan; Ruby, 1 year old, red.
2. J. F. Ijams, Columbus, O., bull Invincible, 1 year old, red.
3. do do cow Clinton Belle, 5 years old, roan.
4. D McMillan, Xenia, bull Gen'l Grant, 2 years old.
5. do do Miami Duke, 1 year old.
6. do do cow Duchess of Oakland, 3 years old.
7 A. J., W. S. & W. A. Powell, Reynoldsburg, bull Washington's Day, with 5 calves, as follows, viz: Challenger, Lilley, Martha Washington, Ellen, and May Flower.
8. A. J. W. S. & W. A. Powell, Reynoldsburg, cow Fanny, 3 years old.
9. C. M. Clark, Springfield, bull Duke of Clark, 2 years old.
10. do do 4 cows: Flora Bell, Easter Day, Anna Hunt, and Lady of Clark.
11. do do cow Flora Bell, 5 years old.
12. do do cow Easter Day, 11 years old.
13. do do cow Anna Hunt, 4 years old.
14. do do cow Lady of Clark, 1 7-12ths.
15. Hills & Jones, Delaware, bull Buckeye Starlight, 4 years old, and 4 cows, viz: Cambria, 2 years old; Star Maria, 2 years old; Idaho, 2 years old; Starlight's Beauty, 2 years old.
16. G. M. Coulter, Reeceville, bull Challenger, 7 years old, and 4 cows, viz: Peach Blossom, Queen Victoria, Emma, and Moss Rose.
17. D. McMillan, Xenia, 1 cow, Jessie, 5 years old.
18. A. J. Powell & Bro., Reynoldsburg, bull Washington's Day, 4 years old.
19. G. M. Coulter, Reeceville, cow Peach Blossom, 5 years old,
20. do do cow Emma, 5 years old.
21. D. McMillan, Xenia, bull and herd of 4 cows.

AWARDS ON CATTLE SWEEPSTAKES.

C. M. Clarke, Springfield, best herd of 1 bull and 4 cows, viz., bull, Duke of Clark; cows, Flora Belle, Easterday, Anna Hunt, and Lady Clark	$100
D. McMillan, Xenia, 2d best herd of 1 bull and 4 cows, viz., bull, Gen. Grant; cows, Jessie, Duchess of Oakland, Lady Fairy 8th, and Carie Watson	50
Hill & Jones, Delaware, best bull and 5 calves, viz., bull, Buckeye Starlight, and calves, Columbia, Star Maria, Idaho, Starlight's Beauty, and Ruby	50
A. J. Powell & Bros., Reynoldsburg, 2d best bull and 5 calves, viz., bull, Washington Day; calves, Challenger, Lily, Martha Washington, Ellen, and May Flower.	25
D. McMillan, Xenia, best bull (Gen. Grant), of any age or breed	50
do do best cow (Jessie), of any age or breed	50

PEDIGREE OF PRIZE ANIMALS SHOWN IN SWEEPSTAKES.

BULL—DUKE OF CLARK. 4720.

Red. Bred by and the property of Chas. M. Clark, Springfield, Clark county, Ohio. Calved Oct. 21, 1861; got by Starlight 2d, 2259, out of Dove by New Year's Day, 746; Easterday by Lord Marquis, (10459); Loyal by Triumph, (8717); Lydia by Matchless, (4428); Laura by Boughton, (2868); Lily by Roman, (2559), by Columella, (904), by Albion, (14), by Cinnamon, (139), by Neswick, (1266).

Cow, **FLORABELLE.** See pedigree under class of Thoroughbred.

Cow—Easterday.

Bred by Mr. Hawkes, Farnley Hall, England. The property of Chas. M. Clark & Co., Springfield, Clark county, Ohio. Imp. by the Clark Co. Imp. Co. Calved March 27 1853; got by Lord Marquis (10459) out of Loyal by Triumph, (8717); Lydia by Matchless, (4428); Laura by Boughton, (2868), Lily by Roman, (2559), by Columella, (904,) by Albion, (14), by Cinnamon, (139) by Neswick, (1266).

Cow—Anna Hunt.

Red. Bred by F. K. Hunt, Ky. The property of Chas. M. Clark, Springfield, Clark county Ohio. Calved Jan. 3, 1860; got by Duke of Airdrie (12730) out of Miss Wiley 4th, by Duke of Athol, (11376); imp. Miss Hudson by Hermes, (8145); Mayoress by Carcass, (3285); Matron by Tyro, (2781); Miss Mason by Falstaff, (1993); No. 6 by Dr. Syntax, (220), by Charles, (127), by Henry, (301); Lydia by Favorite, (252); Nell by the White Bull, (421); Fortune by Bolingbroke, (86), by Foljambe, (263), by Hunchback, (319), bred by Mr. Maynard.

Bull, Gen. Grant. See pedigree under class of Thoroughbred.

Cow—Jessie.

Red. Bred by David Watson, Esq., Union county, O. Now owned D. McMillan, Xenia.
Calved Jan. 10, 1859.

Jessie	By Starlight 2d	2259
1st, Fancy	By imp. Marie	(11799) 6834
2d, Imp. Stapleton Lass	Sailor	(9592)
3d, ———	Liverpool	(8227)
4th, ———	Matchless	(4427)
5th, ———	Back to Barmpton	(54)

Duchess of Oakland. See pedigree under class of Thoroughbred.
Lady Fairy 8th. " " "
Carie Watson. " " "
Bull, Buckeye Starlight. " " "

Star Maria.

Red. Calved May 12, 1862.

Got by Buckeye Starlight, 3718; dam Maria by imp. Marquis, 687, (11787); g. dam Rebecca by Premier, 831; g. g. dam Sandusky by imp. John Bull, (2161); g. g. g. dam imp. Donna Maria by Gledhow, (2061); g. g. g. g. dam Rebecca by General, (1065); ——— Faith (bred by R. Booth) by Warlaby, (692); ——— Phyllis by Agamemnon, (9); ——— ——— by Chancellor, (869).

Idaho.

Red. Calved Feb. 5, 1862.

Got by Buckeye Starlight, 3718; dam Magnolia by Master Miller, 693; g. dam Bettie Anderson by Twin, 1048; g. g. dam Rosa Lee by Prince Charles, 861; g. g. g. dam Lilly Florence by Young Barnby, (11143); g. g. g. g. dam Victoria by imp. Greenholme Experiment, (2095); ——— Clara Fisher by Duroc 454, (3666); ——— Red Bird by Sportsman, 998; ——— Tulip by Mirandi, (4488); ——— Lady Mundy by San Martin, (2599); ——— imp. Mrs. Motte by Adam, (717).

Starlight's Beauty. See pedigree under class of Thoroughbred.

RUBY.

Red. Calved Feb. 9, 1863.

Got by Buckeye Starlight, 3718; dam Rosebud by Master Winfield, 1854; g. dam Ruth Hall by imp. Isaac, 589; g. g. dam Fanny Fern by Prince Charles, 861; g. g. g. dam Young Paint, by Farmer, 492; g. g. g. g. dam Paint by imp. Prince Charles, (2461); —— Rose of Sharon by imp. Comet Halley, (1855); —— Lady of the Lake by imp. Reformer, (2505); —— imp. Rose of Sharon by Belvidere, (1706); —— Red Rose 5th by 2d Hubback, (1423); —— Red Rose 2d by His Grace, (311); —— Red Rose 1st by Yarborough, (705); —— The American Cow by Favorite, (252); —— —— by Punch, (531); —— —— by Foljambe, (263); —— —— by Hubback, (319); —— —— by Jas. Brown's Red Bull, (97).

WASHINGTON DAY.

Roan. Bred by Robt. G. Dun, Plumwood, Madison county, O The property of Jacob Powell, Franklin county, O. Calved Feb. 22, 1860.

Got by Dacotah, 2685, out of Lady Belle by Prince Albert, 854; Ann Barnett by imp. Comet, (1854); Peeress by imp. Symmetry, (5382); Daisy, imp. by Walter Dun in 1833.

ENTRIES OF THOROUGHBRED HORSES.

1 John S. Rarey, Groveport, mare, Thetis, 4 years old and over.
2. same do " Duchess of Athol. 1 year old and under 2.
3. same do filly, sucking colt, Crusette.
4. J. M. Morgan, Grove City, mare, Belle Cara, 6 years old.
5. same do stallion, Bushwhacker, 1 year old.
6. E. D. Leonard, Urbana, " Breckinridge, 8 years old.
7. same do mare, Ariel, 20 years old.
8. same do stallion, Col. Marshall Anderson, 1 year old.
9. B. D. Anderson, Xenia, " Ben. Butler, 5 years old.
10. Jas Alexander, Jamestown, " Woodford, 3 years old.
10½. Reber & Kutz, Lancaster, " Revenge, 6 years old.
11. same do mare, Young Fashion, 8 years old.
12. same do filly, Lady Fashion, 2 years old.
13 same do colt, Malcolm, 2 years old.
14. same do " Chestnut, 1 year old.
15. J. K. Young, Alton, filly, Elois, 1 year old.
16. same do mare, Wagner, 9 years old.
17. J. L. Shaw, Degraff, stallion, Silverheels, 2 years old.
18. C. L, Dorr, Circleville, stallion, Kentucky Lord, 8 years old.

AWARDS ON THOROUGHBREDS.

E. D. Leonard, Urbana, Breckinridge, best stallion 4 years old and over	$50
B. D. Anderson, Xenia, Ben Butler, 2d best stallion 4 years old and over............	25
Jas. Alexander, Jamestown, Woodford, best stallion 3 years old and under 4	25
Reber & Kutz, Lancaster, Malcolm, best stallion 2 years old and under 3	20
E. D. Leonard, Urbana, Marshall Anderson, best stallion 1 year old and under 2....	15
Reber and Kutz, Lancaster, Chestnut, 2d best stallion 1 year old and under 2	10
same do Young Fashion, best brood mare 4 years old and over.	30
E. D. Leonard, Urbana, Ariel, 2d best brood mare 4 years old and over	20
Reber & Kuts, Lancaster, Lady Fashion, best brood mare 2 years old and under 3 .	15
John S. Rarey, Groveport, Duches of Athol, best mare 1 year old and under 2......	10
same do Crusette, best sucking mare colt	10

ENTRIES IN ROADSTERS.

1. Frederick & Pettitt La Rue, stallion, Newbolt Patchin, 5 years old.
2. E. A. Fuller, Clinton, mare, Flora, 3 "
3. F. C. Weatherly, Columbus, mare, Gipsy, 3 "
4. John S. Rarey, Groveport, stallion, Sovereign, jr., 3 "
5. same do " Lord Dorchester, 2 "
6. A. J., W. S. & W. A. Powell, Reynoldsburg, mare, Frank, 5 "
7. Void.
8. Albert Ely, Elyria, stallion, Sovereign, Bellefounder, 3 "
9. same " " Cruiser, jr., 2 "
10. Wm. H. Rarey, Groveport, stallion, Young Bellefounder, 4 "
11. J. C. McDaniel, Franklin co., " Stockbridge Chief, 4 years and 11 months old.
12. A. L. Olmsted, Columbus, " Clinton Roadster, 9 years old.
13. John Swisher, Groveport, " Bob Ridley, 5 "
14. David Taylor, jr., Columbus, mare, 2 "
15. J. A. Payne, Columbus, stallion, Black Hawk Scipio, 9 "
16. Brown & Williamson, Leesburg stallion, Cadmus, 11 "
17. Lamb & Weston, Troy, Ohio, " Searcher, 12 "
18. same do " Buckeye, 2 "
19. Reber & Kutz, Lancaster, mare, Mistogue, 5 "
20. J. Devault, Columbus, sucking mare colt.
21. Mrs. H. C. Lee, Marysville, stallion, Cassius Clay, 7 "
22. A. Ely, Elyria, filly, Stranger, 2 "
23. James Thomas, Franklinton, stallion, Young Clinton Morgan, 3 years old.
24. Void.
25. James Thomas, Franklinton, mare, Susan, 3 years old.
26. James McKelvey, Winchester, mare, 7 years old.
27. Frederick & Pettitt, La Rue, stallion, Newbolt Patchin, 5 years old.
28. Chester Lamb, Welchfield, mare, Flora, 3 years old.
29. W. A. Niel, London, stallion, Mickey Free, jr., 3 years old.
30. Chester Lamb, Troy, mare, 5 years old.

AWARDS ON ROADSTERS.

Lamb & Weston, Troy, Ohio, Searcher, best stallion 4 years old and over	$50
J. C. McDaniel, Central College, Stockbridge Chief, 2d best stallion 4 yrs old and over.	25
John S Rarey, Groveport, Sovereign, jr., best stallion 3 years old and under 4......	25
Jas. Thomas, Columbus, Young Clinton Morgan, 2d best stallion 3 yrs old and under 4	15
Lamb & Weston, Troy, Buckeye, 2d best stallion 2 years old and under 3	10
E. A. Fuller, Clintonville, Flora, best mare 3 years old and under 4................	20
Chester Lamb, Welchfield, Flora, 2d best mare 3 years old and under 4	15

ENTRIES IN HORSES FOR GENERAL PURPOSES.

1. G. W. Williams, Columbus, filly, Jennie, 2 years old, sorrel.
2. N. Van Loon, Worthington, filly, Sweetbriar, 3 years old, iron grey.
3. E. A. Fuller, Clintonville, mare, Ky. Whip, 6 years old, chestnut.
4. G. W. Neff, Columbus, stallion, Slashem, 4 years old, bright bay.
5. Samuel A. Campbell, Circleville, stallion, Benecia Boy, 5 years old, sorrel.
6. H. Emrich, Columbus, stallion, Gen. Carrington, 6 years old, mahogany bay.
7. Wm. McDonald, Columbus, mare, Lady Allman, 4 years old and over.
8. same do stallion, sucking colt.
9. Chester Johnson, Columbus, filly, 1 year old.
10. R. Cook & Bro., Galena, stallion, Young Clinton, 4 years old and over.

11. J. S. Rarey, Groveport, mare, Bird, 4 years old and over.
12. same do sucking stallion colt.
13. same do Mare, Flora Cruiser, 2 years old and under 3.
14. Chas. H. Newell, Dublin, Ohio, stallion, Bull of the Woods, 9 years old.
15. same do mare, Jenny Lind, 3 years old and under 4.
16. F. Raymond, Franklinton, mare, Fanny, 7 years old.
17. same do sucking stallion colt.
18. A. J., W. S. & W. A. Powell, Reynoldsburg, sucking mare colt.
19. same do mare, Belle, 4 years old.
20. Albert Ely, Elyria, sucking stallion colt.
21. same do mare, Lady Margaret, 4 years old and over.
22. J. M. Morgan, Grove City, mare, Susan Bukey, 6 years old.
23. same do sucking stallion colt.
24. same do stallion, Sam Clark, 3 years old.
25. D. P. Egbert, Lebanon, stallion, Wagner, 8 years old.
26. H. A. Warner, Adelphi, Ross co., O., stallion, Mack, 4 years old.
27. Louis Krob, Columbus, stallion, Morgan Eagle, 6 years old.
28. T. B. Vance, Lockbourne, stallion, Gen. Grant, 1 year old.
29. P. F. Eagard, Delaware, stallion, Grant, 5 years old.
30, same do " Gen. McClellan, 5 years old.
31. Lawrence Luckhaupt, Columbus, suckling stallion colt, 3 months old.
32. David Taylor, Jr., Columbus, stallion, Old Bellfounder, 14 years old.
33. J. C. Noe, Reynoldsburg, stallion, Bellfounder, 2 years old.
34. Wm. Wellwood, Pleasant Valley, stallion, Young America, 9 years old.
25. same do do Capt. Wilkins, 8 do
36. same do do Young America, Jr., 2 years old.
37. same do mare, Lady Jane, 6 do
38. Thos. Johnson, Columbus, stallion, Pete, 4 years old.
39. Geo. Bierce, Cleveland, stallion, Hunker, 7 do
40. Lamb & Weston, Troy, stallion, Champion Searcher, 8 years old.
41. Chester Lamb, Troy, mare, (no name) 3 years old.
42. same do do do 1 year old.
43. Dennis Ryan, Reynoldsburg, mare, Flaxey, 8 years old.
44. James Thomas, Franklinton, stallion, Young Ben Franklin, 2 years old.
45. Cumming & Shaw, De Graff, do Selim, 7 years old.
46. J. L. Shaw, do do Sucker Boy, 2 years old.
47. J. D. Kinnard, Columbus, mare, Betty Gray, 4 years old.
48. John Hall, Milford Center, mare, Jenny Fleming, 4 years old.
49. Philip Sutton, Jamestown, stallion, Monarch, 10 years old.
59. Chester Lamb, Welchfield, do Tom, 2 years old.
60. F. C. Bigelow, Columbus, do Young Norman, 3 years old.
61. Jno. W. McCann, Hilliard Station, stallion, Bill.

AWARDS ON HORSES FOR GENERAL PURPOSES.

D. P. Egbert, Lebanon, Wagner, best stallion, 4 years old and over	$50
Saml. A. Campbell, Circleville, Benicia Boy, 2d best stallion, 4 years old and over	25
J. M Morgan, Grove City, Sam Clark, 2d best stallion, 3 years old and under 4	15
J. C. Noe, Reynoldsburg, Bellfounder, best stallion, 2 years old and under 3	20
Wm. Wellwood, Pleasant Valley, Young America, Jr., 2d best stallion, 2 years old and under 3	10
T. B. Vance, Lockbourne, Gen. Grant, best stallion, 1 year old and under 2	15
J. M. Morgan, Grove City, best suckling stallion colt	10

H. Raymond, Franklinton, 2d best suckling stallion colt	$5
J. M. Morgan, Grove City, Susan Bukey, best brood mare, 4 years old and over	30
E. A. Fuller, Clintonville, Ky., Whip, 2d best do do	20
Chas. H. Newell, Dublin, Jenny Lind, best do 3 years old and under 4	20
G. W. Williams, Columbus, Jennie, best do 2 do do 3	15
J. S. Rarey, Groveport, Flora Cruiser, 2d best do 2 do do 3	10
C. Johnson, Columbus, best filly, 1 year old and under 2	10
Chester Lamb, Troy, O., 2d best filly, 1 year old and under 2	5

DRAFT HORSES.

2. Chester Johnson, Columbus, filly, 3 years old.
4. Stephen Spooner, Darby Creek, stallion, Normandy, 14 years old.
5. J. D. Robinson, do do (no name) 4 do
6. Robt. Kile, do do Bill, 3 do
7. Martin Hiller, Marion, do Gen. Grant, 1 year and 4 months.
8. Jas. Duvalt, Columbus, do Norman, 5 years old.
9. P. T. Engard, Delaware, do Non such, 10 do
10. David Taylor, Jr., Columbus, do Franklin Giant, 5 years old.
10½. T. S. McFarland, Urbana, do Highflyer, 1 year old.
11. Andrew Boughton, Mansfield, do Champion of Cheshire, 8 years old.
12. Geo. Bierce, Cleveland, do John, 7 years old.
13. Jacob Kellstadt, Circleville, mare (no name), 8 years old.
14. A. Obetz, Columbus, mare, 5 years old.
15. Francis Jones, Alton, stallion, Ohio Frenchman, 5 years old.
16. John Jones, do stallion colt, Norman Bay, 2 do
17. James Thomas, Franklinton, mare, Kate, 8 years old.
18. C. E. McCarty, Xenia, mare, Norman, 4 years old.
19. Chas. Fullington, Milford, mare, Norman Gray, 9 years old.
20. same do do 2 do
21. James Thomas, Franklinton, stallion, Young Turk, 14 months old.
22. J. O. Baker, Milford Center, stallion, Bill, 10 years old.
23. David Martin, Columbus, stallion, Young Norman, 3 years old.

AWARDS.

Stephen Spooner, Darby Creek, Normandy, 2d best stallion, 4 years old and over	$25
David Martin, Columbus, Young Norman, best stallion, 3 years old and under 4	25
Robt. Kile, Darby Creek, Bill, 2d best stallion, 3 years old and under 4	15
John Jones, Alton, Norman Bay, best stallion, 2 years old and under 3	20
Martin Hiller, Marion, Gen. Grant, best stallion, 1 year old and under 2	15
T. S. McFarland, Urbana, Highflyer, 2d best stallion, 1 year old and under 2	10
Chas. Fullington, Milford Center, Norman Gray, best brood mare, 4 yrs. old and over	30
Jacob Killstadt, Circleville (no name), 2d best brood mare, 4 years old and over	20
Chester Johnson, Columbus, do best filly, 3 years old and under 4	20
Chas. Fullington, Milford Centre, (no name), best mare, 2 years old and under 3	15

MATCHED HORSES AND MARES.

1. P. E. Frederick, La Rue, O., mare Fanny, 6 years old (trotter).
2. E. A. Fuller, Clintonville, gelding, Tom Hyer, 6 years old (pacer, sweepstakes).
3. David Williams, Columbus, mare, Julia, 6 years old (light harness).
4. N. Van Loon, Worthington, gelding, Yankee Tom, 5 years old (trotter).
5. same do do do do (trotter, sweepstakes).

6. E. A. Fuller, Clintonville, gelding, Tom Hyer, 6 years old (light harness).
7. E. A. Fuller, Columbus, stallion, Prince, 7 years old (trotting stallion).
8. S. A. Campbell, Circleville, gelding, Western Bill, 6 years old (light harness).
9. J. F. Ijams, Columbus, mare, Mary, 12 years old (light harness).
10. Wm. McDonald, Columbus, mare, Ella Knight, (saddle).
11. same do do Betty, do
12. Geo. McDonald, do gelding, Dr Momford, 6 years old (saddle).
13. D. P. Cook, Galena, gelding, ———, 6 years old (light harness).
14. C. B. Adams, Columbus, 1 pair matched roadsters.
15. J S. Rarey, Groveport, 1 pair coach horses.
16. A. J. & W. S. & W. A. Powell, Reynoldsburg, mare, Scipio, 5 years old (for saddle).
17. Wm. H. Rarey, Groveport, stallion, Young Bellfounder, 4 years old (trotter).
18. W. Irwin, Grove City, stallion, Blanco, 6 years old (saddle).
19. J. M. Morgen, do mare, Pacer, 7 years old, do
20. J. N. Denny, S. Bloomfield, 1 pair matched roadsters.
21. J. P. Stocton, Columbus, mare (under saddle).
22. Lewis Krob, do do do 3 years old.
23. Daniel Boyd, Darby Creek, 1 pair matched horses (draught).
24. Geo. Stevens, do 1 pair matched roadsters.
25. same do 1 do
26. same do gelding, 6 years old (light harness).
27. same do mare, do do
28. same do mare, do do
29. same do gelding, do do
30. same do mare, do do
31. J. Norton, Boston, Mass., geldings, 1 pair roadsters, 4 years old.
32. Jas. Richardson, Kirkersville, O., mare, 6 years old—saddle.
33. Jesse B. McCoy, Kilbourne, Delaware Co., O., 1 pair matched roadsters, 6 yrs. old.
34. L. G. Delano, Kingston, gelding under saddle.
35. Brown and Williamson, Leesburg, 1 gelding for light harness, 9 years old.
36. L. D. Woodmansee, Dayton, stallion Tom Rolf, trotter sweepstakes, 9 yrs. old.
37. same do do fastest trotter, 9 yrs. old.
38. Hiram Stott, Lima, pacing mare, Pocahontas, 5 years old.
39. J. L. Tyler, Alexandria, 1 pair matched coach horses, 4 years old.
40. Charles Stewart, Alexandria, gelding for light harness, 8 years old.
41. C. Lamb, Troy, do do 5 do
42. John Radebaugh, Columbus, do do 5 do
43. Chester Lamb, Troy, mare do 5 do
44. same do do 5 do
45. same 1 pair of matched coach horses.
46. Dr. Wm. Trevitt, Columbus, do do
47. same do gelding, Camanche Pony, for saddle.
48. J. Cole, do pacing gelding, 7 years old.
49 same do do under saddle, 7 years old.
50. J. C. Noe, Reynoldsburg, gelding for light harness.
51. M. Radebaugh, Columbus, mare for saddle.
52. C. E. McCarty, Xenia, gelding for light harness.
53. David Williams, Columbus, gelding for light harness.
54. J. M. Brown, Somerset, do do
55. Samuel Pugh, Amanda, do do 4 years old.
56. F. Lowry, Columbus, 1 pair roadsters.
57. W. H. Rarey, Groveport, do

58. W. Hedges, Springfield, 1 pair roadsters, mares, matched.
59. same do 1 pair matched coach horses.
60. same do mare for light harness.
61. Wm. A. Neil, London, stallion, Spartan, under saddle.
62. M. L. Lewis, Worthington, gelding, for light harness.
63. G. S. Deming, Columbus, mare, do do
64. Joseph Hammond, Milford Centre, gelding, pair matched roadsters.
65. Chas. M'Gill, Upper Sandusky, gelding, fastest pacing horse, 4 years old.
66. D. W. Lilley, Wooster, Ohio, gelding, for light harness.
67. J. W. Darst, Baltimore, Ohio, trotting sweepstakes, Jack Brough.
68. Dennis Ryan, Reynoldsburg, gelding, under saddle.
69. James Thomas, Franklinton, gelding, Charlie, under saddle.
70. Robert Reed, London, gelding, under saddle.
71. E. Basset, Milan, Erie Co., mare, for light harness.
72. Lieut. W. B. Nimon, Mansfield, stallions, Jim and Bill, matched roadsters.
73. same do do Jim, for saddle.
74. G. W. Kent, Marysville, 1 pair coach horses, 5 years old.
75 Lyman Barnes, Alexandria, 1 gelding, for light harness, 7 years old.
76. Lamb and Weston, Welchfield, 1 pair matched roadsters, 8 and 12 years old.
77. John Hall, Milford, mare, under saddle.
78. John Burd, Newark, 1 pair matched coach horses.
79. David Taylor, Jr., Columbus, gelding, for light harness, 9 years old.
80. W. H. Albaugh, Circleville, 1 pair bay mares for roadsters.
81. H. B. Cranmer, Lancaster, mare, for light harness.
82. James Horn, London, sweepstakes on pacers.
83. Van R. Glazier, Columbus, gelding, in light harness.
84. F. Dunlevy, Granville, do do
85. same do do under saddle.
86. L. W. Springer, Putnam, mare, for light harness.
87. C. B. Adams, Columbus, gelding, do
88. S. J. Skermerhorn, Jersey, stallion, do
89. A. G. Thomas, London, gelding, do
90. James Low, Columbus, 1 pair matched roadsters.
91. Thos. Dugan, Portsmouth, do do

AWARDS ON MATCHED HORSES AND MARES, GELDINGS AND MARES, AND TROTTERS.

W. Hedges, Springfield, best pair of coach horses	$20
J. L. Tyler, Alexandria, 2d best do	10
Daniel Boyd, Darby Creek, best pair of farm or draft horses or mares	20
W. Hedges, Springfield, best pair of matched roadsters	20
Geo. Stevens, Darby Creek, 2d best do	10
L. A. Campbell, Circleville, Western Bill, best gelding for light harness, 6 yrs. old	20
Charles Stewart, Alexandria, 2d best do	10
W. Hedges, Springfield, best mare for light harness	20
George Stevens, Darby Creek, 2d best do	10
G. L. Delano, Kingston, best gelding for saddle	20
George McDonald, Columbus, 2d best do	10
J. P. Stockton, do best mare for saddle	20
Wm. McDonald, do 2d best do	10

L. D. Woodmansee, Dayton, Tom Rolf, best and fastest trotting stallion	$20
Geo. Stevens, Darby Creek, Fanny, best and fastest trotting mare	20
E. A. Fuller, Clintonville, best and fastest trotting gelding	10
L. D. Woodmansee, Dayton, Tom Rolf, best and fastest trotting horse, mare or gelding	20
E. A. Fuller, Clintonville, Tom Hyer, best pacing or racking horse, mare or gelding.	20

SWEEPSTAKES FOR COLTS AND HORSES.

1. Frederick & Pettit, La Rue, Ohio, stallion, English Glory, 8 years old.
3. S. A. Campbell, Circleville, do Benicia Boy, 5 do
4. Stephen Spooner, Darby Creek, do Normandy and 5 colts.
5. J. C. McDaniel, Central College, do Stockbridge Chief, 4 years old.
6. P. T. Engard, Delaware, do Nonsuch, 10 years old.
7. L. D. Woodmansee, Dayton, do Tom Rolf, 9 do
8. Lamb & Weston, Troy, Ohio, do Champion Searcher, 8 years old.
9. same do do do and 5 colts.
10. same do do Searcher, 12 years old.
11. same do do do and 5 colts.
12. Reber & Kutz, Lancaster, do Revenge, 6 years old.
13. same do mare, Young Fashion, 8 years old.
14. R. Cook & Bro., Galena, stallion, Young Clinton, 6 do
15. C. L. Dow, Circleville, do Kentucky Lord, 8 years old.
15½. Hugh Bell, Chillicothe, mare, Belle, 5 years old.
15½. Col. R. Nevins, Columbus, stallion, Joe Goodwin and 5 colts.
16. D. P. Egbert, Lebanon, do Wagner, 8 years old.
17. R. D. Anderson, Xenia, do Ben Butler, 5 years old.
18. John Hall, Milford Centre, do mare, Jenny Fleming, 4 years old.
19. W. Wellward, Pleasant Valley, stallion, Young America, 9 years old.

AWARDS.

Lamb & Weston, Troy, Ohio, best 5 colts	$40
Stephen Spooner, Darby Creek, 2d do	20
Reber & Kutz, Lancaster, best stallion	50
same do best mare	50

JACKS AND MULES.

1. Wm. McDonald, Columbus, jack, King Philip, 9 years old.
2. do do jack, Midnight, 1 year.
3. do do jennet, Lady Crosby, 8 years.
4. J. M. Mitchell, Grove City, jack, Mohawk, 5 years.
5. D. W. C. Sawyer, London, jack, Osceola, 6 years.
6. do do 2 mule colts.
7. Jacob Fisher, Zanesville, 1 pair mules, Bill & Liz, 3 years and 11½ months.
8. do do mule, Bell, 4 years.
9. J. McKinney, S. Charleston, jack, Young Champion, 4 years.
10. Isaac Powell, Fitzville, jack, Manassa, 2 years.
11. I. L. Shaw, DeGraff, jack, Black Hawk, 2 years.
12. do do jennet, Miss Butler, 6 years.
13. A. D. Rogers, Franklinton, jack, President, 6 years.
14. Daniel Hunt, Centre Village, jennet, 5 years.

AWARDS.

Wm. McDonald, Columbus, King Philip, best jack 3 years old and over	$25
Isaac Powell, Fitzville, Manassa, best jack 2 years old and under 3	15
Wm. McDonald, Columbus, Midnight, best jack 1 year old and under 2	5
I. L. Shaw, DeGraff, Miss Butler, best jennet 3 years old and over	15
Jacob Fisher, Zanesville, Bill & Liz, best pr. mules 2 years old and over	10
D. W. C. Sawyer, London, best pr. of mule colts	5

REPORT OF COMMITTEE.

The quality of stock generally good, a decided improvement on former years.

ISAAC WILSON,
GEO. W. GREGG,
J. T. THOMPSON,
T. M. KIMBALL.

MERINO SHEEP.

There were seventy-five entries, and two hundred twenty animals. The following wer the awards:

John S. Delano, Mt. Vernon, best buck 2 years old and over	$20
S. S. Mathews, Outville, 2d best buck 2 years old and over	10
E. C. Eells, Cornwall, Vt., best buck under 2 years	20
do do 2d best under 2 years	10
Eli Keller, Newark, best pen of 5 ewes 2 years old and over	20
Robert Perrine, Cross Creek, Pa., 2d best pen of 5 ewes 2 years old and over	10
Eli Keller, Newark, best pen of 5 ewes under 2 years	20
J S. Delano, Mt. Vernon, 2d best pen of 5 ewes under 2 years	10
do do best pen of 5 lambs	10
L. J. Wright, Weybridge, Vt., 2d best pen of 5 lambs	5

LEICESTER SHEEP.

There were thirteen entries made in this class, comprising twenty-five animals.

AWARDS.

Thomas Aston,	Elyria,	best buck 2 years old and over	$15
do	do	best buck under 2 years old	15
F. P. Vergin,	Delaware,	best pen of 5 ewes over 2 years old	15
do	do	best pen of 5 ewes under 2 years	15
do	do	best pen of 5 lambs	10

COTSWOLD SHEEP.

There were eleven entries made in this class, comprising thirty-one animals.

AWARDS.

Thomas Aston,	Elyria,	best buck 2 years old and over	$15
do	do	best buck under 2 years	15
do	do	best pen of 5 ewes over 2 years old	15
do	do	best pen of 5 ewes under 2 years	15
do	do	best pen of 5 lambs	10

SWEEPSTAKES.

There were six entries made in this class.

AWARD.

S. S. Mathews, Outville, best fine wool buck of any age or breed	$20

SOUTH DOWNS AND FAT SHEEP.

There were nineteen entries made in this class, comprising fifty-five animals.

AWARDS.

Thomas Bennington, La Porte, best buck 2 years old and over	$15
Wm. Weymot, Cedarville, best buck under 2 years	15
Samuel Toms, Elyria, best pen of 5 ewes 2 years old and over	15
do do best pen of 5 ewes under 2 years	15
Thomas Bennington, La Porte, best pen of 5 lambs	10
Wm. Mathews, Etna, best pen of 5 fat sheep	15
Wm. Weymot, Cedarville, 2d best pen of 5 fat sheep	10
F. P. Vergin, Delaware, best single fat sheep	5

Description and characteristics of Wool and Sheep, exhibited at the Ohio State Fair at Columbus, Sept., 1864, by George W. Pollock, of Gratiot, Muskingum county, Ohio.

The fleeces embrace his clip from what he characterizes as his "Young Pomp," and No. 212 family of American Merino Sheep. The fleeces numbered from 1 to 49 are from his breeding ewes, all except 6 being sired by "Young Pomp." The fleeces of the 2 year olds and yearlings are from sheep sired by No. 212. The dams, except four or five, are the regular "Young Pomp" family.

The sheep were shorn from the 1st to the 15th of May, averaging on the old ewes about 11 months and 10 days growth. The whole clip exhibited averages about 10 lbs., being taken as they run, and not selected so as to get a high average.

"Young Pomp" was purchased of Geo. Campbell, of Westminster, Vermont, in the fall of 1856, having taken first prizes at the two National Fairs of Boston and Philadelphia, and the Vermont State Fairs, and a Silver Medal at New York Institute, in the years 1855 and '56.

"No. 212," was purchased of Geo. Campbell in the fall of 1861, to breed to the issue of "Young Pomp." His sire is "Old Grimes," now owned by Geo. Campbell; grand-sire, "Sweepstakes," now owned by Mr. Hammond.

The clip is exhibited to illustrate the result of *regular breeding in one direction.* The sheep on exhibition, except No. 5, sired by "Young Pomp," are the issues of "No. 212," from the regular "Young Pomp" family. A regular register in regard to the numbering, weight of fleeces, time of dropping lambs, &c., has been kept, from which these facts are taken.

CASHMERE GOATS.

There were eight entries made in this class, consisting of twelve animals.

AWARDS.

Jas. H. McNall, North Star, Pa., best thorough bred buck	$10
Wm. P. Williams, Granville, 2d best thorough bred buck	5
Jas. H. McNall, North Star, Pa., best thorough bred she goat	5
Wm. P. Williams, Granville, 2d best thorough bred she goat	3
McNall and Perrine, North Star, Pa., best 3 kids	5
Wm. P. Williams, Granville, 2d best 3 kids	3

SWINE.

There were sixteen entries made in this Class, consisting of twenty-nine animals.

AWARDS.

Donald Fraser, Columbus, best boar 2 years old and over	$20
Samuel Toms, Elyria, 2d best boar 2 years old and over	10
Geo. Anderson, Painesville, best boar 1 year old and under 2	15
do do best sow 1 year old and under 2	15
J. B. Gates, Hope, 2d best sow 1 year old and under 2	10
Geo. Anderson, Painesville, best sow with litter of not less than 5 pigs	20

SWEEPSTAKES ON SWINE.

There were seven entries in this Class. The awards were as follows:

Geo. Anderson, Painesville, best boar of any age	$15
J. B. Gates, Hope, best sow of any age	15

POULTRY.

There were twelve entries in this Class.

AWARDS.

Henry Bishop, Springfield, best pair of China fowls	$3
do do 2d best pair of China fowls	2
do do best pair of game fowls	3
Chas. Wetzler, Columbus, 2d best pair of game fowls	2
Geo. Hanford, Columbus, best pair of Dorkings	3
Henry Bishop, Springfield, best pair of Polands	3
do do 2d best pair of Polands	2
do do best pair of Spanish fowls	3
Chas. Osborne, Blendon Corners, best pair of turkeys	3
Henry Bishop, Springfield, largest exhibition of poultry	5

REPORT OF COMMITTEE.

The undersigned Committee on Poultry have examined all the stock on exhibition, and had no difficulty in coming to a decision in their awards, which will be found noted against the several entries.

The exhibition of Henry Bishop, of Springfield, was very creditable, and we vote him to be an enterprising "darkey."

JOHN HUFFMAN,
H. A. PECK.

SECOND DEPARTMENT.

MACHINERY AND ENGINES.

In this Class there were eleven entries.

AWARDS.

Haswell, Wright & Co., Circleville, best portable steam engine	$50
Lane & Bodley, Cincinnati, best self-setting saw mill head blocks	5

Walter S. Phelps, Columbus, best iron planing machine	$10
Stout, Mills & Temple, Dayton, best water wheel	5

REPORT OF COMMITTEE.

The Committee appointed by your honorable body to the Second Department, Class First, Machinery, Engines, &c., respectfully submit the following report:

Haswell, Wright & Co., Circleville, O., 1 12-horse power portable engine, 1st premium.

Lane & Bodley, Cincinnati, O., circular saw mill head blocks.

Walter S. Phelps, Columbus, O., rotary planing machine, premium.

Stout, Mills & Temple, Dayton, O., American Turbine water wheel, premium.

Dr. T. J. Kindleberger, Springfield, O., center vent Buckeye Turbine water wheel, recommended.

Benjamin Reed, Alleghany City, Penn., model steamboat wheel, diploma.

Bradford & Sharp, Cincinnati, O., leather belting of superior quality, recommended for premium.

Jas. Thos. Stibbs, Wooster, O, waste saver, card grinder and wool oiler, the three combined in one machine, which the Committee think a valuable improvement, and would recommend to the Board for a premium or diploma, as we find no awards fixed in the list of premiums.

JOHN S. HALL,
W. S. STETSON,
D. B. WYANDT.

AGRICULTURAL MACHINES.

FIRST DIVISION.

In this Division there were fifty entries.

AWARDS.

J. B. Pitts & Co., Dayton,	best threshing machine	$15
do do	best sweep horse power	10
White & Bostwick, Norwalk,	best circular saw mill operated by horse power	5
do do	best log cross cut saw mill operated by horse power	5
D. Whitney, Ashland,	best clover huller and cleaner	5
M. H. Mansfield, Ashland,	best clover huller	5
Whiteley, Fassler & Kelley, Springfield,	best cider mill and press	5
Bomberger, Wight & Co., Dayton,	best horse hay rake	3
Younglove, Dewitt & Co., Cleveland,	best hay, straw and stalk cutter	5
Ridenour & Biser, Springfield,	best hay press	5
Theodore Tong, Lancaster,	best hand corn sheller	2
Fred. Decker, Ostrander,	best clover seed harvester and stripper	Diploma.

Sprout's Compound Cast-steel Tooth Hay and Grain Rake.

The 1st premium was awarded to this Rake at our State Fair at Columbus, September, A. D. 1864.

This Rake possesses the following excellent qualities:

1st. The ends of the teeth run level on the ground, causing the teeth to operate entirely on the hay, instead of scratching or harrowing the ground, taking up the grain or hay without raising the dust or tearing up the rubbish.

2d. The teeth are balanced behind the axle, which gives it a peculiar backward motion in discharging the hay, so as to leave a perfect winrow, and enable any boy who can guide a horse to operate the Rake, as only 15 pounds is necessary to discharge the hay.

3d. The peculiar shape and motion of the teeth make the rake a perfect machine for stirring up hay when beaten down by rain. A boy will turn as much hay with this Rake as ten men will by hand.

4th. The teeth are of triangular steel, with a flat surface on the inward or straining side; the corner behind acting as a brace, renders the tooth strong, light and elastic.

5th. This Rake has an independent regulating spring to each tooth, instead of a weight bar across the whole, which enables the tooth when striking an obstacle easily to surmount the same; at the same time 300 or 400 pounds pressure can be put on the teeth collectively.

6th. It will adjust itself to uneven or rough ground, the position of the horse not changing the position of the teeth to the ground.

7th. This Rake is balanced equally to any sulkey, will take little room to store during the season not in use, is light, neat and substantial.

SECOND DIVISION

In this division there were seventy entries.

AWARDS.

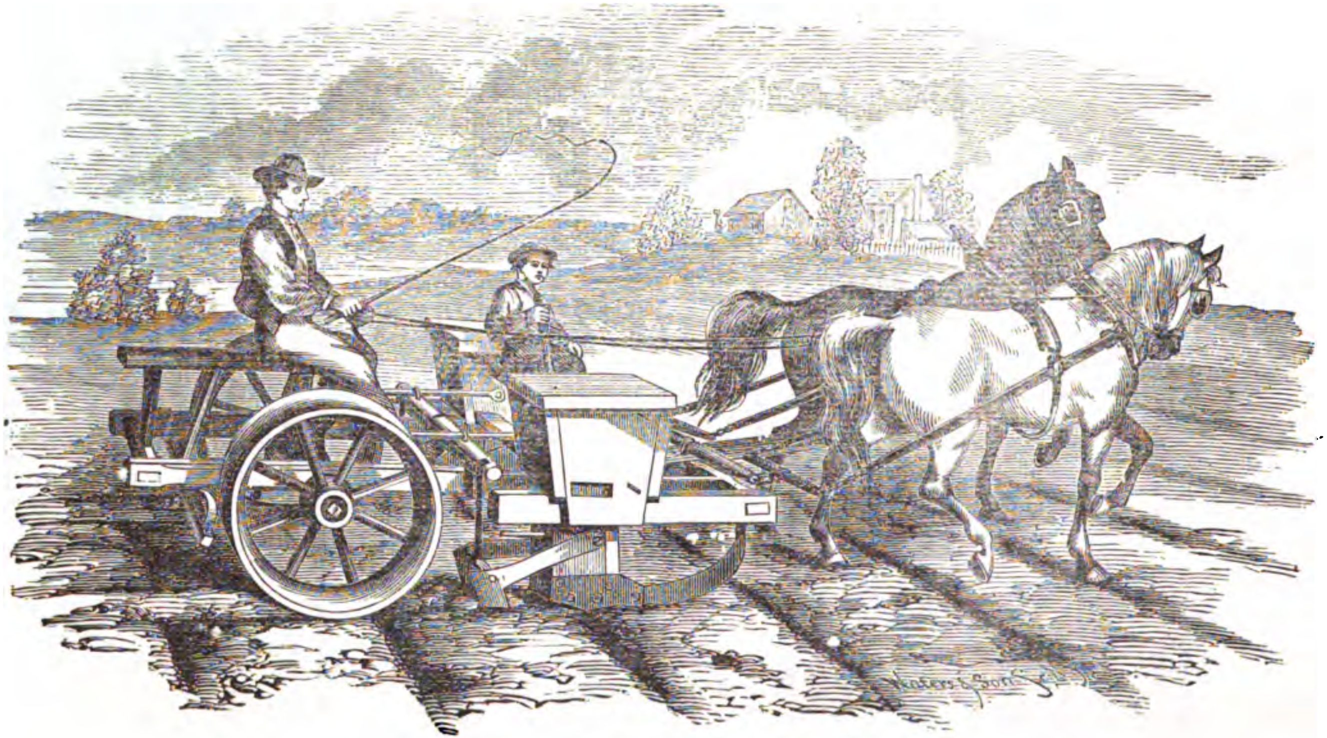
Younglove, Dewitt & Co., Cleveland, best wheat drill, 2 horse	$10
J. Ingels, Milton, Indiana, 2d best wheat drill	5
E. M. French, Springfield, best wheat drill, 1 horse	5
Frederick Decker, Ostrander, best clover seed harvester	5
Warder & Child, Springfield, best self-raking reaping machine	5
Bomberger, Wight & Co., Dayton, best reaping machine	5
Younglove, Dewitt & Co., Cleveland, best mowing machine	5
A. McKinley, Agent, Buffalo, N. Y., best combined reaper and mower	5
Mrs. Mary Manny, Rockford, Ills., best grain binder	5
R. J. Rundell & Bro., Chicago, Ills., best hay pitching machine	3
Brown & Co., Chicago, Ills., best corn-planter (horse power)	5
Nelson J. Jones, Galway, N. Y., corn-planter (hand)	2
Osborn, Dunham & Co., Bedford, O., best field roller and crusher	5
J. N. Clees, Darbyville, best harrow	3
Carpenter, Hawkins & Co., Columbus, best corn cultivator	2
J. M. McGaffey, Dayton, best horse hoe	2
E. M. French & Co., Springfield, best double shovel plow	2

THIRD DIVISION.

In this division there were nineteen entries.

AWARDS.

Jos. Sedgebeer, Painesville, best portable flouring mill	$10
same “ “ grist “	5
same “ best farm feed mill	5
Bonner & Kendrick, Xenia, best fanning mill	5
Mills Brothers, Marcellus, N. Y., best self-regulating wind-mill	5
Fairbanks, Greenleaf & Co., Chicago, Ills., best stock scales for general purposes	15
same “ “ platform scales	5
E. P. H. Capron, Springfield, O., best brick machine	5
J. W. Penfield, Willoughby, O., best drain tile machine	5
E. Nicholson, E. Rockport, O., best farm gate	3
Reuben Haines, Oberlin, O., best portable fence	3
H. A. King, Nevada, best bee hive	3



J. W. Vandiver's Horse-power Corn-planter. Exhibited by Theo. Butterworth, Hannibal, Mo.

TOOLS AND IMPLEMENTS.

In this Class there were thirty-six entries.

AWARDS.

Wood, Fowler & Beery, Upper Sandusky, best corn husking machine	$2
C. H. Warren, Tiffin, best churn	2
J. P. Corbin, Whitney's Point, N. Y., best butter worker	1
J. B. Coffin, Ashland, O., best washing machine	3
Emerson Brothers, Seville, O., best clothes wringer	3
Wm. P. Needles, Columbus, best well pump	3
Wm. B. Wadsworth, Cleveland, best apparatus for raising water	2
Bomberger, Wight & Co., Dayton, best collection of agricultural implements	25

PLOWS.

There were 25 entries in this Class.

AWARDS.

E. M. French & Co., Springfield, best plow for general purposes	$10
Gibbons & Deimer, Columbus, best stubble plow	10
Wm. Whiteley, Springfield, best sod plow	10
E. M. French & Co., best steel plow	10
J. C. Evans, Delaware, best cast-iron plow	10
E. M. French & Co., Springfield, best one-horse plow	3
J. C. Evans, Delaware, best dynamometer	3

REPORT OF COMMITTEE.

The committee award to E. M. French & Co., first premium for one-horse plow; and would also make especial mention of the great variety and number of plows exhibited by that firm. We would recommend that the premiums on plows be reduced, as they are higher than those paid on other articles of greater cost; and also that a premium of —— be offered for the greatest variety of plows exhibited. There is a manifest improvement in the manufacture of steel and combination plows in Ohio, and we think the plow-makers of Ohio are entitled to the thanks of the farmers of the State.

R. R. Donnelly,
Jas. Miller,
R. Foss,
John Carnahan.

THIRD DEPARTMENT.

SILK AND MILL FABRICS.

There were 14 entries in this Class.

AWARDS.

Mrs. Henry S. Babbitt, Columbus,		best pair of silk stockings	$1
Columbus Woolen Manuf'g Co.,	Columbus,	best 10 yards woolen cloth	5
do	do	best 10 yards cassimere	5

Columbus Woolen Manuf'g Co.,	Columbus,	best 10 yards satinet	$5
do	do	best 10 yards jeans	5
do	do	best 10 yards flannel	3
J. D. Osborn & Co.,	Columbus,	best 15 yards woolen carpet	5
Columbus Woolen Manuf'g Co.,	Columbus,	best stocking yarn	3

NEEDLE, SHELL AND WAX WORK.

In this Class there were 124 entries.

AWARDS

G. W. Butler,	Columbus,	best ottoman cover	$3
Mrs. B. F. Martin,	Columbus,	best fancy chair work with needle	3
do	do	best fancy chair cushion and back	3
Mrs. S. R. Holt,	Worthington,	best crochet shawl	2
Miss Emily Van Deman,	Delaware,	best lace cape	3
Miss H. Clemen,	Columbus,	best lamp stand mat	2
Miss Sarah D. Armstrong,	Columbus,	best silk embroidery	3
Mrs. Dr. Rashill,	do	best embroidered sofa cushion	2
H. T. & W. B. Fay,	do	do mantilla	3
Mrs. Harvey Bancroft,	do	do table spread	2
Mrs. E. Bausenwein,	do	do ladies' robe	3
Miss Emily Van Deman,	Delaware,	do dress	3
H. T. & W. B. Fay,	Columbus,	do children's clothes	3
Miss Emily Van Deman,	Delaware,	do under-sleeves	2
do	do	do ladies' collar	2
do	do	do handkerchief	2
do	do	best embroidery with beads	3
Mrs. Henry S. Babbitt,	Columbus,	best tetting collar	3
Mrs. Mary Hopperton,	do	best silk bonnet	3
Miss Josie Klippart,	do	best knit cloak	3
Miss Almira Babbitt,	do	best group of artificial flowers	3
Mrs. A. C. Greenleaf,	do	best specimen of wax flowers	3
Chas. Wiefel,	do	do wax fruit	2
Mrs. Horace Norton,	Cincinnati,	do moss and lichen work	3
Mrs. S. A. Wiley,	Newark,	do cone work	3
Miss Jane E. Heiser,	Chillicothe,	do leaf work	3
Mrs. Horace Norton,	Cincinnati,	do flower work	3
Mrs. S. Loree,	Lebanon,	do shell work	3
Miss Amelia Wright,	Cincinnati,	best embroidered picture	3
Mrs. H. Gray,	Reiley,	best white quilt	3
Miss Mary Davis,	Milford Centre,	best worked quilt	3
Mrs. Wm. Neil, Jr.,	Columbus,	best silk quilt	3
Mrs. Nancy Meeker,	Richmondale,	best patchwork quilt	3
Mrs. Mary F. Scott,	Shadeville,	best childrens' Afghan	2

HOUSEHOLD FABRICS.

In this class there were 50 entries.

AWARDS.

Mrs. Wm. Deardorff,	Columbus,	best pair woolen blankets	$5
Mrs. Geo. Anderson,	Painesville,	2d " "	3

Mrs. Geo. Anderson, Painesville, best 10 yards flannel	$5
Mrs. Davis Trumbo, Hope, best 10 yards linen	5
Mrs. Geo. Anderson, Painesville, best 10 yards linen diaper	5
Same, do " 10 " kersey	5
Same, do " pair kersey blankets	5
Same, do " rag carpet, 15 yds	5
Miss H. Carter, Worthington, 2d " " "	3
George Anderson, Painesville, best 15 yards tow cloth	5
Same, do 2d best " "	3
Mrs. L. W. Eells, Lithopolis, best hearth-rug	5
Miss H. C. McLean, Lockbourne, 2d do "	3
Mrs. C. K. Watkins, Columbus, best pair woolen knit stockings	2
Mrs. John Decker, Lockbourne, 2d best " "	1
George Anderson, Painesville, best pair cotton "	2
Mrs. C. K. Watkins, Columbus, 2d best " "	1
Georgs Anderson, Painesville, best linen sewing thread	2
Mrs Mercia Church, do best pair woolen fringe mittens	2
Same, do " " mittens	2
Mrs. Mary Seelman, Columbus, 2d best " "	1
Mrs. Mercia Church, Painesville, best stocking yarn	2
Mrs. Wm. Renick, Circleville, best woolen shawl	2
Mrs Mary Hopperton, Columbus, best straw bonnets	2
Miss Almira Babbitt, do best grass "	2
Mrs. W. R. Sprague, Reynoldsburg, best gentleman's shirts	2
Mrs. Philip Reed, Columbus, best wove bedspread	2
H. Ridenour, Gahenna, best 10 lbs. dressed flax	5

WORKED METALS.

In this class there were 11 entries.

AWARDS.

Walter J. Phelps, Columbus, best display of brass work	$5 and Silv. Med.
Hall, Ide & Co., do " " files	$3
R. A. S. Janney, agent for Fish, Columbus, best display of lamps	3
Farris & Beebe, Columbus, best display of iron fence and post	3
Wm. Blynn, do " " silver ware	5
Mrs. R. A. S. Janney, do " " tin kitchen utensils	3

REPORT OF COMMITTEE.

The Committee recommend that the manager, at the next Annual Fair, finds a committee tent, where the committees will all report punctually twice each day, during the Fair, at the hours of 10 A.M. and half-past 1 o'clock P.M. As there is a want of concert and punctual attendance and assembling of the respective committees, much annoyance and time could be saved by some such plan. There is a lack of interest on the part of the committee-men. These decisions may be of little interest to a committee-man, but gentlemen composing these committees at fairs, should remember that any want of punctuality or faithfulness in the discharge or their duty, not only detract from the interest and usefulness of all such exhibitions, but increase the anxiety and vexation of the managers, and embarrass and retard very much the harmonious working of the whole exhibition; and the decisions here made are indeed only second in importance to the decisions of the judge and the court, and we think there should be not only a greater interest, but a more punctual attendance, on the part of the committee-men.

The Committee is of the opinion that Mr. Phelps has a new invention for the application of steam power, who professes that it is not only simple and new, but of great practical value, and the Committee is unanimous in the opinion that Mr. P. deserves a premium for his invention; and we especially commend his improvment of the application of steam power to watercraft, to the especial notice of the managers of the Ohio State Board, as he belongs to that class of men who are the real nobility of our land, a working mechanic, whose welfare we know it is your pleasure to promote.

The Committee will take the liberty of recommending to the State Board (with a few honorable exceptions), and that they are unanimous in the opinion, that the merchants, the manufacturers and citizens, are entitled to the 1st premium, for a general indifference and inattention to the ornamentation and decoration of the Domestic and Fine Art halls, and for lack of interest in the success of the exhibition; but the Committee is happy to notice one fact, that the few merchants and manufacturers who did take the pains to exhibit their products and their wares, have had the largest sales, and have received the universal thanks of all visitors; for all know that the pleasure and interest of State Fairs are much increased, and much of its interest can only be furnished, by the residents of the city in which it is held.

The Committee award Messrs. Hall, Ide & Co., of Columbus, the first premium on files, and wish to call the attention of the merchants and manufacturers of the United States, and especially of Ohio, to the character and quality of these files. All the members of this committee speak from a personal knowledge of the quality of these files, and take great pleasure in recommending the files made by Hall, Ide & Co. to the trade, as being in every way equal, if not superior, to those of English manufacture; and hope the day is not far distant, when all manufacturers and merchants will give home manufactures the preference over all English goods, and think the premium on files should be $50 instead of $3, believing that if the file makers of the United States can but receive the fostering care and increasing attention of the managers of these State Fairs, the time is rapidly approaching when, instead of importing from England millions of dollars worth of files, the file makers of the United States will be large exporters of files to foreign countries, as American hardware. Manufacturers are fast driving out all foreign productions, and the Committee commend the file manufacturers of the State to the especial care and mention of the managers of the Ohio State Board.

The Committee take great pleasure in awarding Messrs. Farris & Beebe, of Columbus, a premium for their combination fence, with adjustable gate, hinge and latch, and think it combines all the elements of a good yard fence, viz.: beauty, strength and durability.

The Committee award the first premium to Jas. Ohlen & Co., for their display of saws. The Committee is surprised that the saw makers of Ohio should have been entirely overlooked by the Board of Managers, and, for their benefit, will take the liberty in saying that the manufacture of saws in Ohio is constantly on the increase, Cleveland, Columbus and Cincinnati taking the lead, and are now producing as good an article of saws—circular, mulay and cross-cut—as can be had in any country; and the Committee are unanimous in the opinion, that this branch of domestic manufacture should receive the sympathy and support of the State Board, as it was but a few years since the American people were entirely dependent upon England for every saw they used; but, after much patience, labor and perseverance, the saw makers of the United States have driven the English entirely out of market.

A fruit can, though a small thing, is worthy of special notice, and deserves a premium. A good fruit can is one of the necessities of the age, and the Committee trust it will receive due notice in the next Premium List; and we desire to commend the improvement of Mr. W. Webster to your special notice.

The Committee thinks Mr. Blynn is entitled to the special thanks of the visitors to the State Fair, as one of the merchants of the city of Columbus who has taken some pains to ornament and increase the interest of the occasion, by exhibiting a case of beautiful silver ware, and think if all the merchants and citizens had done as much, the pleasure and interest of the Fair would have been materially enhanced.

R. R. Donnelly,
E. M. French,
J. P. May,
} *Awarding Committee.*

STOVES AND CASTINGS.

In this class there were 22 entries.

AWARDS.

W. L. Marvin, Cleveland, best wood cooking stove	$5
same do best coal do	5
Gorton, Aston & Co., Columbus, best parlor stove	5
same do best warming furnace	5
same do best specimen marbleized iron	5

CABINET WARE.

In this class there were 2 entries.

AWAAD.

Miss Mary McClelland, Columbus, best writing-desk	$2

WOODEN WARE.

In this class there were 4 entries.

AWARD.

James Hogeman, Williamsburg, best grain measures	$2

SADDLERS' WARE.

In this class there were 16 entries.

AWARDS.

F. H Watt, Columbus, best traveling trunk	$5
same do best carpet sack	2
R. T. Cook, do best set of carriage harness	5
Thos. J. Magruder, Marion, best display of saddles and bridles	5
Miss Josie Klippart, Columbus, best pair of ladies' slippers	1
Richard Thornton, Cincinnati, best display of gloves and mittens	3
Smith & Conrad, Columbus, best display of ladies' furs	3

CHEMICALS.

In this class there were 17 entries.

AWARDS.

R. Lewis & Sons, Toledo, best display of candles	$3
Joseph Fromherz, Cincinnati, best display of writing fluid	1

The Committee on Chemicals (or what is left of it) beg leave to say to the honorable body of the Ohio State Board, that the display of articles of Class 11, 3d Department, is simply contemptible.

Faithfully yours,
G. H. FICKARDT.

PHILOSOPHICAL AND SURGICAL INSTRUMENTS.

In this class there were 8 entries.

AWARDS.

A. A. Hardy, Cleveland, best barometer	Diploma.
F. A. Lesquereux, Columbus, best chronometer	Diploma.

GLASS, CROCKERY, ETC.

In this class there were 11 entries.

AWARDS.

Wm. L. Miner, Columbus, best sample drain tiles	Diploma.
E. P. H. Capron & Co., Springfield, best pressed bricks	Diploma.

FOURTH DEPARTMENT.

FARM PRODUCTS—FLOUR AND GRAIN.

In this class there were 48 entries.

AWARDS.

C. &. J. Link, Van Wert, best barrel Ohio made flour	Diploma and $5
same do 2d best do	3
Geo. Andersen, Painesville, best half bushel white winter wheat	3
H. Ridenour, Gahenna, best half bushel red winter wheat	3
A. W. Livingston, Reynoldsburg, best half bushel spring wheat	3
F. C. Weatherby, Columbus, 2d best half bushel spring wheat	2
Geo. Anderson, Painesville, best half bushel Mediterranean	3
H. Ridenour, Gahenna, 2d do do	2
Geo. Anderson, Painesville, do rye	3
same do do oats	3
R. Baker, Avon, do barley	3
Chas. Osborn, Blendon Corners, do flax-seed	3
H. Ridenour, Gahenna, do timothy seed.	3
A. W. Livingston, Reynoldsburg, do clover.	3
S. R. Holt, Worthington, do orchard grass	3
V. D. Moore, Central College, best sample, yellow corn	2
L. Curtis, Galena, 2d best sample yellow corn	1
R. G. Moler, Columbus, best sample white corn	2
H. Ridenour, Gahenna, best sample early corn	2
A. W. Livingston, Reynoldsburg, 2d best sample early corn	1

BUTTER AND BREAD.

There were 23 entries in this class.

AWARDS.

J. W. Innis, Columbus, best 10 lbs. roll butter	$10
Andrew Havens, Lewis Centre, 2d best 10 lbs. roll butter	5
R. Baker, Avon, best 25 lbs. May or June butter	10
Mrs. Mary Thomas, Columbus, best tub or firkin, 50 lbs. butter,	10
" " " best biscuit	2
H. Stimmel, " best 3 loaves domestic bread	3
Mrs. W. R. Sprague, Reynoldsburg, best 3 loaves domestic corn bread	3
" " " brown bread	3

STATEMENTS OF EXHIBITERS.

Columbus, September 25, 1864.

Mr. Klippart—I have been hoping to be able to put our report in such a form as to give you as little trouble as possible, but find, after waiting even to this date, that I have nothing, or at least very little to make it from. I have learned that Mrs. Thomas and Mrs. Innis have each left their report with you. Probably Mr. Baker did likewise; and as he had no post office address with his butter, I have not been able to ascertain anything with regard to it. The quantity of butter entered was not very large, but with one or two exceptions, of excellent quality, so that it was really a very nice matter to award the ten pound premiums. Mrs. Phinney had a fine lot of butter, and as she writes so intelligently, I inclose her plan of making it.

The entries of bread of different kinds was very meagre, and I think almost any of us could do as well if we would try. There were no other articles of class 4, fourth Department, represented. I also inclose Mr. Havens's report.

Very truly,

Eliza B. Kimball.

Marblecliff Ohio, Sept. 27, 1864.

The process by which I prepared ten pounds of butter for the Ohio State fair is as follows, viz:—The milk was gathered from four cows in the space of three or four days, or eight milkings, and strained in eight-quart tin pans, which were allowed to stand twenty-four hours, at which time the cream was taken off and churned in two churnings, being careful to add about one-half its bulk of good pure well water, and churn carefully so as not to heat the cream by the friction of churning. When the butter had separated from the milk, I took it immediately from the churn to the tray, and there washed it thoroughly in pure water until all the milk was separated from the butter. I then salted it with fine table salt, and after the space of twenty-four hours worked or pressed it three or four times, at which time it was ready for packing or table use. This is the Orange county process of making butter.

Mrs. John W. Innis.

COLUMBUS, Ohio, Sept. 13, 1864.

A statement of my butter making, or the process which I go through from the time the milk is taken from the cow until marketed:

First—I am careful to strain immediately after milking, in tin pans holding from six to eight quarts, with a small portion of water to each pan to cool the milk.

Second—I am careful to take the cream off as soon as the milk is sour, not allowing it to stand longer than twenty-four hours.

Third—Churn as often as once every twenty-four hours, and before churning the cream, add one-half water and churn slowly in warm weather. In cool weather add warm water.

Fourth—When the butter is completely gathered, I take it out and wash and press all the buttermilk out.

MRS. J. W. INNIS.

I gathered the milk from ten cows, strained in tin pans and let it stand twenty-four hours, then skimmed it and churned in a dash churn. I washed the butter with cold water, salted with solar salt, and worked it well with a ladle. I again let it stand for twelve hours, and worked out all the whey or milk, when it was fit to pack or roll.

I fed my cows on grass only.

ANDREW HAVENS.

AVON, September 5th, 1864.

Milch Cow "Empress," roan, entered by R. Baker, Avon, Lorain connty, Ohio. Was calved in June, 1855, now being nine years old. Was got by Corsair, out of a three-fourth Durham cow. Empress calved March 30th, 1864. She was put to bull again June 29th.

She gave in ten days, commencing June 15th, 426 lbs. of milk, from which was made 20½ lbs. of butter. She also gave in ten days, commencing August 16th, 364 lbs. of milk from which was made 17½ lbs. of butter.

The cow was fed on grass alone from May 9th to present date.

During the first trial she was put on to good fresh feed. A few days previous to second trial she was put into a meadow, from which had been mowed timothy and clover hay.

The weight of the cow, 1,006 lbs.

R. BAKER.

This is to certify that I milked "Empress" during the trials, helped to weigh the milk, assisted in making the butter, and weighed the same, and believe the above statement correct.

ALFRED BAKER.

Personally came before me, a Justice of the Peace for Lorain county, R. Baker and Alfred Baker, and made oath that the above statement is correct.

PHILIP SAWYER, J. P.

AVON, September 5th, 1864.

Milch Cow "Lizzie," red and white, (6th vol. A. H. B.) entered and owned by R. Baker, Avon, Lorain county, Ohio. Was calved May 10th, 1861. Got by Avon, (3652), out of Irene, by Sir Humphrey, (974); Empress by a son of imp. Prince Charles, (2461); Julia by Red Jacket, (143), of Scioto, imp. (1834).

Lizzie calved March 29th, 1864. She was put to bull again June 27th. She gave in ten days, commencing June 15th, 1864, 368 lbs. of milk, from which was made 18½ lbs. of butter. She also gave in ten days, commencing August 16th, 316 lbs. of milk, from which was made 15¼ lbs. of butter.

The cow was fed on grass alone from May 9th to present date.

During the first trial she was put on to good fresh feed. A few days previous to second trial she was put into a meadow, from which had been mowed timothy and clover hay. Weight of cow 1,015 pounds.

R. BAKER.

This is to certify that I milked "Lizzie" during the trials, helped to weigh the milk, assisted in making the butter, and weighed the same, and believe the above statement correct.

ALFRED BAKER.

Personally came before me, a Justice of the Peace for Lorain county, Ohio, R. Baker and Alfred Baker, and made oath that the above statement is correct.

PHILIP SAWYER, J. P.

My butter was made September 12th, 1864. The number of cows seven. No food but grass, bran and salt every other day. The milk strained in earthen crocks, standing twenty-four hours before skimming; churned in a common dash churn; freed from milk by working with a ladle; about one-half pound of salt to ten pounds of butter; no other substance used.

MRS. DAVIS TRUMBO,
Hope, Franklin Co.

My butter was made last week, from the milk of five cows, that were fed entirely on grass.

The milk was strained two inches in depth into tin pans.

It was kept in a cool, well-ventilated cellar, and the cream skimmed off as soon as the milk turned sour, (which was generally two days), taking as little milk as possible.

The churning was performed in a stone dasher churn, and the butter was freed from the milk by simply working with a wooden ladle.

The salt was not measured with exactness, but believed to be an ounce and a half to a pound. It was common Onondaga salt. No sugar, saltpetre, or other substance was employed.

MRS. T. O. PHINNEY.

CHEESE.

In this class there were 2 entries.

AWARDS.

S. E. & H. N. Carter, Painesville,		best and largest lot of cheese	$20
Same,	do	best cheese under one year old	10

TO THE AWARDING COMMITTEE ON CHEESE.

GENTS: You are presented with 19 samples of cheese, to which your attention is called and a careful examination respectfully solicited.

Numbers 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, were made on corresponding days of June, 1864; all from the milk of fifty cows, evening and morning's milk, with no addition of cream.

Process of Manufacture.—The evening's milk is strained into the vat, and the animal heat taken therefrom by pouring cold water into the water chamber of the vat and setting tin holders filled with cold water into the milk. What cream has arisen during the night is dipped into the strainer, and the morning's milk poured into it. A fire is made in the heater, and the milk brought to a temperature of 84 degrees. Enough rennet is then added to coagulate the milk and make it sufficiently firm to cut in 60 minutes. Then cut, with a wire cutter, into inch square blocks. It then stands 20 minutes. Then work the curd carefully with the hands 20 minutes. Then take off a portion of the whey and start a fire in the heater Commence heating gradually, stirring carefully until the temperature reaches 94 degrees. Then shut off the heat and cover the vat with a cloth, and let it stand 60 minutes. Then take off some more whey. Start the fire, and continue to work the curd with the hands until it is raised to a temperature of 104 degrees. Cover with a cloth and let stand one hour, or until sufficiently cooked. Then get the whey off, and salt with Onondaga Factory filled salt—two pounds and four-tenths to the 100 gallons of milk. Work the curd fine before putting to press. Press one day, with a 2-inch wrought iron screw, as hard as one man can turn with a lever four feet in length. After taking from the press, grease and turn every day.

Preparation of Rennet.—Kill the calf at five days old, when their stomachs are empty; salt them, inside and out, and hang them up to dry. When one year old, and dry, put one dozen into a crock, to which add salt and water; let stand until the strength is out, when it is fit for use.

To question 1st. We answer, improved natives.

2d. Timothy, red and white clover.

3d. Long-continued pasturing exhausts the soil. Rotation of the grasses, with other crops rightly managed, will improve it.

4th. When cheese commands eight cents per pound, dairy lands may be used profitably at 35 dollars per acre.

5th. The proper temperature of a room for curing cheese should range from 75 to 80 degrees; a much higher temperature would cause too rapid a state of fermentation, causing a sharp, pungent flavor and bitterness. At a much lower temperature, fermentation is too slow, causing the whey, or moisture, to remain too long in the cheese, and producing a sourish bitterness.

All of which is respectfully submitted.

S. E. & H. N. CARTER.

Painesville, Lake Co., Ohio.

SUGAR.

In this class there were 20 entries.

AWARDS.

Clark Sorgho Machine Co., Cincinnati, best sorgho mill	$10
C. B. Darrow, Orland, Ind., best sorgho evaporator	10
C. Jacobs, Columbus, 2d best "	Silv. Med. or 7
F. F. Wing, Worthington, best ¼ acre of sorgho made into syrup	20
C. Jacobs, Columbus, best gallon sorgho syrup	10
N. P. Mix, do 2d best "	5
H. H. G. Smith, Toledo, best gallon maple syrup	5
W. R. Sprague, Reynoldsburg, best 10 lbs. maple sugar	5

REPORT OF COMMITTEE.

Your Committee found the Sorgho mills very good. The preference given to Clark's mill was on account of strength and general utility; and it was found at work.

Your Committee found the Evaporators all very good. The preference given to Cook's

Improvement, was on account of capacity, and sinks in the bottom of the pan to receive the sediment.

Your Committee found several very fine specimens of maple syrup on exhibition, all very creditable to the producer.

GEO. ANDERSON,
T. P. JOHNSTON.

ORLAND, STEUBEN CO., IND., Feb. 16th, 1865.

MR. KLIPPART—*Dear Sir:* I send you a description of my improvement on Cook's Evaporator, with a statement of what is claimed for it, for publication in the annual report of the Agricultural Society of the State of Ohio.

It is claimed that this Evaporator as now presented, combines, in a convenient and practical form, every principle necessary to success in manufacturing syrup and sugar from the Northern cane, or sorgo.

The first requisite is the quality of the syrup; the second is the speed, or the quantity that can be made at a given cost of time and fuel. In both of these requirements this pan is without any formidable competitor. The crimped bottom gives more metallic surface, consequently more evaporation over a given space, than a plain bottom can. The transverse current carries the impurities to the sides, and prevents the mixing of the crude juice with the syrup; the sinks in the cooling surface at the sides catches the sediment. These sinks constitute the improvement above mentioned; they are placed at the ends of the partition, so that the juice, in passing around each partition, must flow over one of them.

The sediment, which forms a coat on the bottom of all evaporators, making it necessary to draw the fire and clean out frequently, is deposited in these sinks and taken out with a small scoop, thereby rendering the pan capable of being run any length of time desired without stopping, and keeping the pan clean all the time; the advantages of which are a more rapid evaporation, a more uniform quality of syrup, avoiding the liability to burn, for if the bottom is clean there is no danger of burning, and saves the time and labor of cleaning the pan. The same labor that will run the old pan three-fourths of the time and clean it in the other fourth, will run the improved pan all the time, thereby adding one-fourth to the capacity of the pan without any increase of labor, and doubling the net profit to the operator.

C. B. DARROW.

PRESERVES.

There were ninety-one entries in this Class.

AWARDS.

J. L. Reed	Van Wert	best	10 lbs. honey	$5
Edwin Corner	Columbus	2d best	10 lbs. honey	3
Charles Osborn	Blendon Corners	best canned	blackberries	1
do	do	do	raspberries	1
Mrs. W. R. Sprague	Reynoldsburg	do	peaches	1
Mrs. S. McCormick	Columbus	do	pears	1
Mrs. Henry Innis	do	do	apples	1
Mrs. S. McCormick	do	do	quinces	1
Mrs. Henry Innis	do	do	gooseberries	1
do	do	do	currants	1
do	do	largest and best	variety of canned fruits	5
Mrs. W. R. Sprague	Reynoldsburg	do	do pickles	5

Edwin Corner, Columbus, best apple jelly	$1
Mrs. John Radcliff, Zanesville, best currant jelly	1
Edwin Corner, Columbus, best peach jelly	1
do do quince jelly	1
Mrs. S. McCormick, do preserved plums	1
do do pickled cucumbers	1
Mrs. W. R. Sprague, Reynoldsburg, best pickled mangoes and melons	1
do do do onions	1

VEGETABLES AND ROOTS.

In this Class there were one hundred and eighty-six entries.

AWARDS.

G. S. Innis, Columbus, best ½ bushel Neshannock potatoes	$3
H. Ridenour, Gahanna, 2d best ½ bushel Neshannock potatoes	1
M. McMillen, Toledo, best ½ bushel any other variety potatoes	2
do do best and greatest variety Irish potatoes, ½ peck each	5
A. W. Livingston, Reynoldsburg, best ½ bushel sweet potatoes	3
J. Basch, East Cleveland, 2d best ½ bushel sweet potatoes	1
do do best 12 parsnips	2
do do best 12 carrots	2
S. R. Holt, Worthington, best 6 long blood beets	2
Jacob Young, Columbus, best 6 turnip beets	2
M. McMillen, Toledo, best 6 sugar beets	2
G. S. Innis, Columbus, best peck tomatoes	2
A. W. Livingston, Reynoldsburg, best display in variety and quality of tomatoes	4
J. Basch, East Cleveland, best 3 drum head cabbages	2
do do best 3 heads red Dutch cabbage	2
Geo. Zwicker, Circleville, best 3 heads any other variety	2
J. Basch, East Cleveland, best 3 heads caulliflower	2
C. C. Norton, Columbus, best ½ peck red onions	1
J. Basch, East Cleveland, best ½ peck yellow onions	1
A. W. Livingston, Reynoldsburg, best ½ peck white onions	1
J. Basch, East Cleveland, best ½ peck pickling peppers	1
J. Reep, Columbus, best 6 roots salsify	1
J. Basch, East Cleveland, best 3 marrow squashes	2
do do best 3 Hubbard squashes	2
G. S Innis, Columbus, best 3 crook neck squashes	2
J. Basch, East Cleveland, best display in quantity and variety	4
G. S. Innis, Columbus, best display of pumpkins in quantity and variety	3
Edwin Corner, Columbus, best peck of sweet corn in ear	2
H. Ridenour, Gahanna, best display of sweet corn in quality and variety	3
A. W. Livingston, Reynoldsburg, best 3 mountain sweet water melons	2
G. S. Innis, Columbus, best 3 green fleshed musk melons	2
A. W. Livingston, Reynoldsburg, best 3 yellow fleshed musk melons	2
do do best and greatest display of melons of all varieties, musk and water	4
J. Basch, East Cleveland, best 6 radishes	1
A. W. Livingston, Reynoldsburg, best ½ peck Lima beans	2
J. Basch, East Cleveland, best ½ peck white bunch or soup beans	2

Geo. Zwicker,	Circleville,	best ½ peck kidney bunch beans	$2
do	do	best ½ peck pole beans other than Lima	2
A. W. Livingston,	Reynoldsburg,	best and greatest variety of peas	3
J. Basch,	East Cleveland,	best 3 purple egg plants	1
do	do	best 6 stalks of rhubarb	2
do	do	best and greatest variety of vegetables	10

FIFTH DEPARTMENT.

HORTICULTURAL.

FLOWERS—PROFESSIONAL LIST.

In this Class there were twenty-five entries.

AWARDS ON STOVE AND GREEN HOUSE PLANTS.

A. G. Hanford & Bro.,	Columbus,	best collection of 20 varieties	$10
A. Pfeiffer & Son,	Cincinnati,	2d do do	5
do	do	best specimen plant in or out of bloom	3
do	do	best collection of 10 varieties bower plants	5
A. G. Hanford & Bro.,	Columbus,	2d best collection of 10 varieties bower plants	3
do	do	best single specimen	1
do	do	best collection of aloes and cactus in pots	2
A. Pfeiffer & Son,	Cincinnati,	best collection of ferns and lycopodiums	3
A. G. Hanford & Bro.,	Columbus,	2d best collection of ferns and lycopodiums	2
do	do	best and largest collection verbenas in pots	3
do	do	best collection of 24 named varieties of dahlias	5
do	do	do 12 do	3
do	do	best and largest collection of named roses	5
do	do	do do phloxes	2
do	do	best display of asters	2
do	do	best and largest display of cut flowers	3
do	do	best parlor bouquets	1
do	do	best hand bouquets	2

FLOWERS—AMATEUR LIST.

In this Class there were seventeen entries.

AWARDS.

Mrs. W. R. Sprague,	Reynoldsburg,	best 12 varieties green house plants	$5
Adam Wiesbaker,	Columbus,	2d best 12 varieties green house plants	3
do	do	best specimen plant	3
Mrs. W. R. Sprague,	Reynoldsburg,	best collection fuschias in pots	3
do	do	do ferns and lycopodiums	3
Mrs. Isaac Eberly,	Columbus,	greatest display of cut flowers	3
Mrs. W. R. Sprague,	Reynoldsburg,	2d greatest display of cut flowers	2
Mrs. Alex. Houston,	Columbus,	best pair hand bouquets	2

OPEN TO ALL.

Mrs. G. M. Parsons,	Columbus,	best floral ornament	$5
Mrs. H. Coit,	Columbus,	2d best floral ornament	3

Mrs. F. M. Holmes, Columbus, best hanging basket of growing flowers	$3
Mrs. R. W. Sprague, Columbus, 2d best hanging basket of growing flowers	2

The Committee on Flowers report as follows:

The display of flowers was exceedingly meagre for so large a city, and reflects little credit on the citizens of Columbus and vicinity. The ornamentation of Floral Hall is very beautiful, and deserves a better filling. Mr. Stelzig did his duty in this behalf.

H. C. Noble,
C. Lempert.

FRUIT.

APPLES

In this class there were nine entries.

AWARDS.

J. Austin Scott, Toledo, best ten varieties of five each	$5
W. Merion, Columbus, 2d " "	3
J. Austin Scott, Toledo. best six " "	3
" best half bushel of ten varieties	5
" best display in variety and quality	10
H. C. Noble, Columbus, 2d " "	5

PEACHES, PEARS, PLUMS, QUINCES AND BERRIES.

In this class there were — entries.

AWARDS.

Geo. Powers, Perrysburg, best ten varieties of pears, five each	$5
A. B. Buttles, Columbus, 2d best " "	3
C. Limpert, Groveport, best five " "	3
Jas. M. Westwater, Columbus, 2d best " "	2
H. C. Noble, " best three " "	3
Geo. Powers, Perrysburg, 2d " " "	2
C. Limpert, Groveport, best peck of one variety	3
" 2d "	2
A. G. Hanford & Bro., Columbus, best display in variety and quality	10
Geo. Powers, Perrysburg, 2d " "	5
C. C. Norton, Columbus, best twelve quinces	3
W. R. Sprague, Reyneldsburg, 2d "	2
Mrs. L. Cushman, Columbus, best plate of twelve plums	2
A. G. Hanford & Bro., " best quart of raspberries	3
H. H. G. Smith, Toledo, best collection of native uncultivated fruits	5
" " " nuts	5
" best peck of whortleberries	3

LIST OF APPLES FROM H. C. NOBLE, COLUMBUS, O.

Rambo.
Bellflower.
Rhode Island Greening.
Esopus Spitzenburgh.
Flemmish do
Newtown do
Black Apple.
Winter Catlin.
Wells Apple.
Canada Red.
Peck's Pleasant.
Hubbardston Nonsuch.
Honey Greening.
Seever's Redstreak.
Jonathan.
Belmont.
Boston Russet.
English do
Newtown Pippin.
Pennock.
Tewksbury Winter Blush.
White Pippin.
Swaar.
Cooper.
Gravenstein.

LIST OF APPLES FROM F. C. WEATHERBY, COLUMBUS, O.

Golden Pippin, (5 each).
Golden Russet.
Romanite.
Raules Jannet (Rock Rimmon)
Rambo.
Paradise Sweet (winter).
Winesap.
Seek-no-further.
Large Fall Pippin. (pound).
Rhode Island Greening.
Esopus Spitzenberg.
Ladies' Sweeting.
Ladies' Apple.

LIST OF PEARS EXHIBITED BY F. STEWART, COLUMBUS.

Beaurie Diel.
Dix.
Compte Delamy.
Passe Colmar.
Glout Morceau.
Stephens' Genessee.
Louise bonne de Jersey.
Doyenne de Ete.
Glory of Cambrone.
Swan's Orange.
White Doyenne.
Buffum.
Belle Lucrative.

LIST OF PEARS FROM H. C. NOBLE, COLUMBUS, O.

Flemmish Beauty.
White Doyenne.
Belle Lucrative.

GRAPES.

There were seventeen entries in this class.

AWARDS.

A. Pfeiffer & Son, Cincinnati, best six varieties of four bunches each	$5
C. Limpert, Groveport, best three varieties of six bunches each	3
Jacob Young, Columbus, 2d best " " "	2
A. Pfeiffer & Son, Cincinnati, Best new seedling	4
" " best ten varieties three bunches each	10
Morrison, Bell & Co., Portsmouth, 2d "	5

FOREIGN,

Samuel Nock, Louisville, best three varieties of two bunches each, grown under glass	4
A. Pfeiffer & Son, Cincinnati, 2d " " "	3

VARIETIES OF HARDY NATIVE GRAPES FROM MESSRS. MORRISON, BELL & CO., PORTSMOUTH, O.

Coleman's White.
Coiraina of Mexico.
Clinton.
Kisam.
Lyman.
Logan.
Norton's Virginia.
Marque.
Monster Catawba.
Miner's Seedling.
Allen's Hybrid, No. 1.
Doctor Brinkel.
Herbemont.
Longworth's No. 2.
Longworth's No. 6.
Longworth's No. 20.
Mexico Red Fox.
Mexico Brown Fox.
St. Marion.
Rebecca.

Isabella Seedling—cross with Union Village and Isabella; also a few vines, summer's growth, from eyes, in pots.

LIST OF GRAPES FROM A. PFEIFFER & SON, CINCINNATI, O.

Minor's Seedling.
Coleman's White.
Logan.
Cuyahoga.
Marion.
Marique.
Lyman.
Monstrous Catawba.
Cigar Box.
Herbemont.
Allen's Hybrid, No. 1.
Isabella Sedling, of Shaker.
Taylor's Bullet.
California Rosea.
Rebecca.
California White.
Norton's Virginia.
Seedling from Delaware.
Dr. Brinkle.
Courrano Mexico.
Longworths, No. 6.
Isabella.
Black Fox.
Red Fox.
Port.
Clinton.
Ives Madeira.
Oporto.
Concord.
Catawba.
Lenoir.
Delaware.
Longworth's, No. 20.
Allen's Hybrid, No. 3.
Lincoln.

FOREIGN GRAPES.

Muscat of Alexander, Black Hamburg, Palestine, Syrian

LIST OF GRAPES FROM H. C. NOBLE, COLUMBUS, O.

Rogers' Hy'ds, Nos. 1, 4, 15, 19.
Diana.
Concord.
Hartford Prolific.
Delaware.
Isabella.
Catawba.
Herbemont.
Elsinburgh.
Cigar Box.
Clinton.
Logan.
Lydia.
Rebecca.
Anna.
Northern Muscadine.
Norton's Virginia.

SIXTH DEPARTMENT.

FINE ARTS—DRAWINGS, PAINTINGS, Etc.

In this class there were 61 entries.

AWARDS.

M. Witt,	Columbus,	best life size oil colored photograph, by Ohio artist.	$10 and Sil. Med.
E. S. Walker,	do	2d best life size oil colored photograph, O. artist..	5 and Diploma.
Sarah A. Sirvault,	Columbus,	best oil painting, by American artist...............	$10
Doct. C. Rashill,	do	best oil painting, by Foreign artist....................	10
A. F. Smith,	do	best specimen in water colors....................	Sil. Med.
do	do	2d best uncolored photograph......	Diploma.
Wm. Ewing,	do	best specimen of fruit painting.....	Sil. Med.
Misss Anna Thomas,	do	best specimen of flower painting..........	Sil. Med.
M. Witt,	do	best specimen daguerreotypes......	Sil. Med.
Miss Bella Howard,	do	best fancy painting, by Ohio artist............	Sil. Med.
A. Cowley,	Pittsburg, Pa.,	best specimen of penmanship......................	Diploma.
Mrs. Alex. Houston,	Columbus,	best specimen of crayon drawing.............	Diploma.
Miss Roxanna Moore,	Central College,	best specimen of pencil drawing........	Diploma.
Bryant, Stratton and Felton,	Cleveland,	best specimen of pen drawing	Diploma.

SCULPTURE DESIGNS, Etc.

In this class there were eight entries.

AWARDS.

Nicholas Boesel, Lowell, O., best carving in wood.............................. Diploma

Henry W. Hanford, Columbus, best collection and greatest variety Ohio birds, prepared	Sil. Med
J. J. Beard, Columbus, best bridge (model of)	Diploma

MUSICAL INSTRUMENTS.

Four entries were made in this class.

AWARDS.

F. C. Light, by J. S. Fassett, agent, Columbus, best square piano	Sil. Med.
Allen Latham, Columbus, best flute	Diploma.

COMMENDATION LIST OF 1864.

J. S. Rarey, Groveport, roadster stallion, Lord Dorchester, 2 years old.
James McKelory, Winchester, roadster mare, 7 years old.
David Taylor, jr., Columbus, roadster mare, 2 years old.
J. T. Engard, Delaware, draft stallion, Non-such, 10 years old.
Eli Keller, Newark, merino buck, Monitor, 1 year old.
L. J. Wright, Weybridge, Vt., merino buck, 1 year old.
McNall & Perrine, North Star, Pa., merino buck, 1 year old.
Jones & Pinney, West Cornwall, Vt., merino 5 ewes, 2 years old.
Geo. W. Pollock, Gratiot, O., merino 5 ewes, 2 years old.
do do 81 fleeces wool.
Dr. T. J. Kindleberger, Springfield, water wheel.
Benj. Reed, Alleghany City, Pa., model steamboat wheel.
Bradford & Sharp, Cincinnati, leather belting.
Thomas Stibbs, Wooster, waste saver, card grinder and wool oiler.
E. Remington & Sons, Ilion, N. Y., sweep horse power.
O'Ferrall, Daniels & Co., Piqua, threshing machine.
Warner Brothers, Norwalk, log cross-cut saw mill horse power.
M. H. Mansfield, Ashland, clover thresher, huller and separator.
John C. Birdsell, South Bend, Indiana, clover thresher, huller and separator.
Tobias Lane & Co, Richmond, Indiana, hay, straw and stalk cutter.
Hawkins & Howe, Akron, horse hay rake.
L. & P. K. Dederick, Albany, N. Y., model hay press.
J. C. Evans, Delaware, hand corn sheller.
Wright & Hohnan, Springfield, fanning mill.
L. & P. K. Dederick, Albany, N. Y., coal elevator.
S. N. Taylor, Horicon, Wisconsin, threshing machine knuckle or coupling.
J. F. Seiberling, Massillon, reaper and mower.
W. A. Kenowlton & Co., Rockford, Ills., Rebel's pat. grain binder attached to J. H. Manney's combined reaper and mower.
W. H. McClelland, Tiffin, hay pitching machine (Raymond's Patent).
Wood, Fowler & Beery, Upper Sandusky, hay pitching machine.
J. M. McGaffey, Dayton, cultivator, planter and horse hoe combined.
Thomas & Mast, Springfield, sulky corn cultivator.
J. N. Clees, Darbyville, grain gatherer.
David Lippey, Mansfield, rack for feeding sheep.
R. L. Howard, Buffalo, N. Y., people's portable farm feed mill.

Stanford & Gilchrist, Lebanon, fanning-mill.
W. B. Wadsworth, Cleveland, self-regulating windmill.
E. P. H. Capron & Co., Springfield, brick press.
R. Lovett, Canton, Union beehive.
Chas. E. Petrie, Cherry Valley, stanchion fastener.
Lippy & Linn, Mansfield, oven for drying fruit.
Cilley & Lines, Canton, Mich., Knowlton's farm ladder.
James Hannas, Cleveland, self-sustaining ladder.
J. A. Kidney, E. Rockport, self-ringing mop.
G. C. Dolph, West Andover, expansion cheese hoop.
J. B. Davidson, Oberlin, soldiers' fryingpan and camp-kettle.
E. M. French & Co., Springfield, No. 23 plow for general purposes (comb. steel)
Gibbons & Deimer, Columbus, steel plow for sod.
Jas. A. Weed & Co., Binghampton, N. Y., revolving land side plow.
J. D. Osborn & Co., Columbus, damask curtains.
same do lace do
Miss Sarah Armstrong, do variety of silk embroidery.
Mrs. S. A. Wiley, Newark, specimen of shell-work.
Mrs. E. A. Fuller, Clintonville, white bed quilt.
Mrs. J. B. Thompson, Columbus, white knit quilt.
Anna L. Kanaga, do patch-work quilt.
Mrs. A. Morgan, do worked quilt by lady 60 years of age.
Mrs. Jno. Naughton, do wreath of hair flowers.
Mrs. M. E. Mason, do hair flowers.
Mrs. Dr. Rashill, do suspenders of worsted and silk.
Mrs. Alex. Houston, do ornamented hair (from Ireland).
Miss Mary Rhoads, do specimen of hair braid work.
Miss Jennie Gifford, Galena, do do
Mrs. Geo. Anderson, Painesville, woolen stocking yarn.
Mrs. A. H. Sells, Columbus, display of bonnets.
Miss Jennie Bye, do gentlemen's shirts and machine work.
Mrs. Davis Trumbo, Hope, wove bed spread.
Sarah J. Robinson, Columbus, Esquimaux dog-hair stockings and mittens
Mary Seelman, do knit balmoral skirt (woolen).
Mrs. S. Lovell, Lebanon, buckskin coat made by Indians.
W. L. Starr, Columbus, alarm door-bell.
John Jones, do J. C. Butterworth's patent sash fastener.
Jas. Ohlen, do case of saws.
W. Webster, Middleton, fruit cans.
Gorton, Aston & Co., Columbus, cooking stove for wood and coal.
Stuart & Emery, do gas cook stove.
C. Emerick, do parlor cook stove.
same do sadiron heaters.
Josiah Shider, Sandy Pt., Columbiana county, patent wood roofing.
N. E. Lovejoy, Columbus, wood eave trough.
R. T. Cook, do buggy harness.
Smith & Conrad, do display of hats, furs and military goods.
G. C. Worth, Upper Sandusky, patent rein guard.
F. H. Watt, Columbus, display of trunks and valises.
Henry Faus, Reynoldsburg, boot crimping machine.
S. W. Ludlow, Columbus, case of dentistry.
M. Kleeman, do glazier's diamond.

Lawrence, Cain & Co., Cleveland, case of artificial legs and pads.
Cross & Dane, Chicago, Ill., assortment of lanterns.
Donald Fraser, Columbus, half bushel white corn meal.
same do do yellow do
Bomberger, Wight & Co., Dayton, Hedge's sorgho-mill.
H. Ridenour, Gahenna, Parisian squash.
G. S. Innis, Columbus, Iowa squash.
same do cucumbers.
Lindeman & Co., Columbus, Swiss view in confection.
Amos. H. C. Brice, Newark, ladies' watch chain of hasel nuts.

THE STATE FAIR—OPINIONS OF THE PRESS.

AFFAIRS ON THE GROUND LAST EVENING—ENTRIES OF STOCK, ETC.

[From the Ohio State Journal.]

The 15th Annual Ohio State Fair, opening to-day and continuing four days, will be, of course, the great event of this week for the citizens of Columbus and adjacent country. It opens under auspices the most favorable. The beautiful location of the grounds in Stewart's Grove one mile south of the Capitol, the delightfully clear and serene weather in the daytime and the bright, soft moonlight at night, the well forward condition of farm-work generally, and the admirable arrangements of the Board for exhibiters andvisitors of all classes, all combine to assure a great success in the present exhibition.

ON THE GROUND LAST EVENING.

Of the grounds themselves and the several halls, we have already in our columns given descriptions so full there is no need for us now to recapitulate them. We spent the afternoon yesterday at the grove, however, and will furnish our readers instead a few items concerning affairs, as we found them, up to six o'clock last evening.

The indefatigable Secretary, Mr. Klippart, and his assistants were, of course, up to their eyes in work, but so perfect is the system adopted in his office that very little delay will be experienced by exhibiters or other parties, even at the busiest periods. The superintendents of the various departments were also busily at work, supervising and completing arrangements entrusted to their respective cares.

The number of entries is fully equal to that of last year at the same stage, and probably exceeds it. There were, however, but comparatively few articles arranged for exhibition in the halls; but large quantities were on the ground still unpacked, and will, of course, be arranged this morning. Power Hall, as might be expected, was more largely taken up than any one of the others. Here Messrs. Younglove & Dewitt, of the Cleveland Agricultural Works, are among the principal exhibiters. They have Hubbard's mower, cider mill, grain drill, etc. J. H. Manny, of Rockford, Ill., is also on the ground with his well-known reapers and mowers, one combined machine having the rotary binder, and another the self-raking attachment.

Among a number of other exhibiters here we noticed Owens, Lane & Dyer, Hamilton; Haswell, Wright & Co., Circleville; and Thomas Stibbs, Wooster.

Floral Hall is most tastefully festooned with garlands of arbor vitæ, fir and other evergreens. In the hall for Fine Arts we remarked two or three paintings in oil belonging to Dr. Rashill, of this place, and a very pretty and well-preserved collection of sea mosses, gathered by Mrs. Alex. Houston, on the western coast of Ireland, in July 1863.

THE STOCK.

A large proportion of the stock arrived yesterday. Many very fine animals were already in when we passed along the stalls at five o'clock, few of them, however, being from remote sections of the State.

In the class of horses we may specify the following: "Stockbridge Chief," (from the famous old grey of the same name) a four year old stallion, entered as a roadster, by J. C. McDonald, Blendon township, in this county. A brown stallion for all purposes, and a bay gelding for light harness, by R. Cook, Galena, Delaware county. Chester Johnson, of Franklin township, in this county, has a one year old Morgan filly, and a Bellfounder three year old sorrel filly for draft purposes. Some wonderfully well-built, clean-limbed trotting stock is brought by J. Reber, Lancaster. He shows "June Sweetener," a one year old horse colt "Revenge" a six year old stallion, "Malcolm," a two year old bay stallion; "Flora Fairfield," a five year old bay mare, and "Young Fashion," a sorrel mare, one of whose colts is the well-known race-horse "Surprise," and another, "Lady Fashion," a two year old filly, is here on exhibition. Philip R. Fredericks and David Pettit, of Marion county, have "England's Glory," a stallion entered for draught purposes and sweepstakes—a magnificent specimen of the old English heavy draught horse, with elephantine 'understandings" and a mane fully three feet long,—and "Newbold Patchem," a bay stallion for all purposes. Mr. Fredericks also enters a black mare, "Fanny," for the green trotting purse, to be competed for by horses which have never before trotted for money. "Wagner," a stallion for all purposes, was the only one yesterday on the ground of three horses which D. P. Egbert, of Lebanon, expects to have here. The beautiful thoroughbred bay stallion, "Ben Butler," is entered again by Richard Anderson, Xenia. Philip Sutton, of the same county, has the draft stallion, "Monarch;" Peter Engard, of Delaware, a grey Norman stallion, and Martin Hiller, of Marion county, an iron-grey colt from "England's Glory," both entered in the same class.

The cattle, so far as we noticed, were all Durhams. Daniel McMillan, Esq., of Xenia, one of the Executive Committee and Superintendent of the Department of Hogs, Sheep, and Poultry, has twelve head of fine stock, comprising bulls, cows and yearlings. Major John F. Ijams and A. J. Powell and Brothers, of Truro township, exhibit respectively three and eight head. Jared Forsman has a one year old bull from "Starlight." The three last named exhibiters are all from this county.

We saw no swine, but the department for sheep was already quite full. With two or three exceptions, the entries were all of Spanish merinos. A considerable number are from Vermont, as we mentioned a day or two since, and chiefly from West Cornwall, Addison county, in that State. They are brought here by A. J. Jones, A. L. Bingham and E. E. Eels, and L. J. & J. A. Wright. The first named has in his lot 10 bucks, for which he has refused $2,000 before leaving Vermont, and the second named parties a ram, "Hibbard," for which they refused $4,000. Columbus & John Delano, Mt. Vernon, Ohio, have a lot of 32 sheep, among them a buck raised by W. R. Sanford, of Orwell, Vermont, for which they paid $2,500. Among other exhibiters in this class are: Daniel McMillan, Xenia, 10 head; Samuel S. Williams, Granville, Licking county, 9 head; Eli Kellar, and Chas. Stoolfire, both of the same county, 13 and 11 head, respectively; and Robert Perrine, Washington county, Penn., 11 head. Besides the sheep above mentioned, S. S. Williams exhibits 12 cashmere goats, which we doubt not will attract the attention which their patriarchal dignity of demeanor deserves.

WATER, SHADE, REFRESHMENTS, ETC.

In these two prime necessities to a well-chosen Fair ground, shade and water, the present Fair will be found exceedigly well provided. The magnificent oaks composing the grove furnish the former, and nine wells, supplied with good pumps, the latter. Judging from the number of booths we saw receiving and arranging their comestibles yesterday, there will be an abundance of refreshments for all the hungry comers, who may not prefer going up town for their meals, upon the grounds.

The race course of half a mile is not in first rate condition, but amateur driving and riding over it will probably give it a harder and smoother bottom before it will be needed for the trials of speed on to-morrow and Thursday.

No awards will be made by the examining committees until to-morrow afternoon. It is hoped that their labors will be completed by Thursday evening.

The entries and necessary arrangements will all doubtless be completed to-day. To-morrow will be one of the "big days" of the Fair. Let everybody come that can, and keep coming till they see it all.

OPENING DAY—ATTENDANCE, RECEPTION, ETC.—THE SEVERAL HALLS.

The attendance on yesterday, the opening day of the State Fair, was light, nor were the number of articles actually upon the ground last evening such as should have been the case at that stage of the Fair. This may be attributed, we suppose, in great measure, to the inauspicious aspect of the heavens from midday on, culminating about four o'clock in the afternoon in a disagreeable, pattering drizzle, which increased about dark to a steady, pouring rain. Many of the exhibiters naturally preferred not to expose their goods in such weather, relying upon fair weather to-day to make amends for the delay in getting their articles in proper order for exhibition.

The receipts, of course, were not heavy, but we are, notwithstanding, informed they fall but little, if anything, short of the first day's receipts at Cleveland last year. Large numbers of entries continued to be made yesterday, and many more will doubtless come in to-day. It is still probable that in this respect the present exhibition will fully equal that of any year since the outbreak of the war.

THE STOCK.

In the department of stock the exhibition is a fine one, and especially in sheep and cattle. The number of pens provided for the former were yesterday morning found to be inadequate, rendering additional accommodations necessary. Some of the horses brought here yesterday were not taken out to the grounds at all, the owners preferring to stable them in the city over night, on account of the rain. We had not time to examine the stalls with much care, and shall, therefore, postpone giving any additional names of exhibiters, or detailed descriptions of the stock, until to-morrow.

FLORAL HALL.

To every one one possessed of any refinement or taste this hall must be a real joy, for it is indeed, a thing of beauty. Its decorations we have never seen excelled at any fair, for their simple yet artistic arrangement and effect. The garlands, of arbor vitæ, white cedar, hemlock and pitch pine, gracefully drape from pillar to pillar, and make the hall a very attractive place of themselves. The display of flowers, however, was not near so full yesterday as could have been desired, but the efficient superintendent of this department, Mr. J. Stelzig, informs us that he expects m any additions, in the course of to-day. Cut flowers, of course, it was not to be expected would arrive sooner. But two firms of professional florists were on the ground yesterday—Hanford of the Columbus nursery, and A. Pfeiffer & Son, Cincinnati. The former occupies the large pyramidal stand in the center of the building with a varied display of greenhouse flowers and plants in pots, while the latter have a choice, though smaller display of the same kind on the stand in the north wing of the hall.

Among the amateur exhibiters here, we noticed Frederick Jaeger, Adam Weisbaker, and Mrs. Alex. Houston, all of Columbus. There were two beautiful hanging baskets received last evening which will be suspended to-day.

FINE ART HALL.

The meagerness of the display in this department reflects little credit upon the citizens of Columbus, upon whom, of course, the main reliance has been necessarily placed for filling the neat and somewhat costly building devoted to it. Our artists are represented here, however, by a tolerably large and really excellent display by M. M. Griswold; by four fine portraits of A. S. Baldwin's taking, colored by Mrs. B.; and by photographic collections also from the galleries of M. Witt and E. S. Walker. Many of the counterfeit presentments of the human face divine which appear here will be universally recognized as admirable likenesses of some of our most distinguished townsmen. Some pencil drawings of diverse, though for the most part real merit, are offered by Miss Roxina Moore, Central College, and Miss Ada Osgood, Miss Bella Howard, and Miss Kate Eberly, Columbus. A. Schrader has some drawings and photographs. There are also a few paintings on exhibition by their owners—Miss Bella Howard, Mrs. Dr. Rashill and Mrs. H. H. Kimball—all, we understand, the works of American artists, and some of them very good.

The Cleveland Commercial College was alone, up to last evening, in its distinctive class. The penmanship which it sends here comprises numerous and beautifully executed specimens of chirography and pen pictures and extravaganzas. They will attract much attention.

Among the articles miscellaneous and curious, we notice a Swiss view in confection, executed by Chas. Reimers, of Lindeman & Stevenson's establishment; pine wood fans, by F. M. Forbes, of Co. C, 7th O. V. I.; a collection of sea mosses by Mrs. A. Houston, and an original autograph letter of Thomas Jefferson's, exhibited by James Glover. These parties are all of this city. An interesting feature of the south wing is a large case of beautiful taxidermical specimens, Ohio birds stuffed; entered by Henry W. Hanford, also of Columbus.

DOMESTIC HALL.

Some very beautiful specimens of ladies' work and domestic fabrics are here exhibited, the former being almost entirely by the fair sex of Columbus and immediate vicinity. Considerably more of the same kind, however, will be necessary to give to the hall a creditable apprearance of fullness.

H. F. & W. B. Fay, in the department of needle and bead work, have some very nice cloaks, and other articles of feminine apparel, (concerning which, the reporter confesses plainly he understands but little.) J. D. Osborn & Co. have a gorgeous display of carpets, curtains, etc. The Columbus Woolen Manufacturing Company occupy their space with the useful rather than ornamental. They have here numerous rolls of their substantial goods,—diagonal cassimeres, single and double twills, jeans, stocking yarn, etc. A few webs of home-made linen, rag carpets, woolen blankets and stockings, gentlemen's shirts, knit and worked quilts, etc., are also to be found among the useful articles, while patch-work quilts, of course, abound.

Mrs. H S. Babbitt has a variety of articles of exceeding taste and beauty, comprising "cone work" card baskets and watch-case, tetting collar, etc. The same characterization may be given the braided hat of "Quito" grass, the wreath of artificial flowers, etc., from the hands of Miss Almira Babbitt. Specimens of hair braid work by Miss Mary Rhoades, Miss Jennie Gifford and Mrs. John Naughton, will be greatly admired, and still more perhaps the flower work in hair by Mrs. M. E. Mason. There is wax fruit by Chas. Weifel, and two beautiful cases of wax flowers by Mrs. A. C. Greenleaf. The shell work boquet of Miss Ada Osgood is exquisite.

Mrs. G. H. Hampson has a pretty little bead basket. Of the same kind is the bead work of Mrs. H. Clemen. Mrs. A. Hudson has some shell frames, very neat and chaste. Mrs. Horace H. Norton shows a collection of mosses and fungi in a glass case with rustic frame of acorns, oak leaves, etc., and another of mosses alone. Some of the latter were gathered several years ago in the very grove where the fair is now being held. Mrs. Kate Heim has a frame of the same kind ot rustic beauty. Four Central American drinking utensils are exhibited by Mrs. H. Coit. They are calabash bowls, with unique carvings done with simply a knife.

Among the exhibiters of fancy needle work and embroidery, most of which, by the way, is really nice, are Miss Sarah D. Armstrong, Mrs. B. F. Martin, Mrs. H. Bancroft, Mrs. Alex. Houston, Mrs. John Naughton, Mrs. Dr. Rashill, Mrs. Kate Heim, Mrs. S. E. Wright, (Cincinnati,) Mrs. Theodore Comstock, Mrs. G. H. Hampson, Mrs. G. W. Butler, Mrs. T. O. Pinney, and Miss Jennie Doolittle. We had almost omitted to notice the two cases of bonnets exhibited by Mrs. A. H. Sells,—an exhibition of forgetfulness which our lady readers, we fear, will consider unpardonable when they see "that love of a bonnet" itself.

FARM IMPLEMENT HALL.

This hall was last night more nearly filled than any other on the ground. The exhibition of reapers and mowers has probably never been excelled in this State. Plows, grain drills, and a number of other implements, are also quite full in number.

The hall is under the excellent superintendence of Mr. C. Smith, of Marion, Ohio, and Horace H. Norton, so well known to the citizens of Columbus as the former Principal of the High School here.

FARM PRODUCE AND FLOWER HALLS.

Neither of these halls was near full last night. The former has not received proper attention from the farmers of this county. The pomological display is particularly meagre.

COME OUT TO THE FAIR.

The weather last night was not propitious. But if sunshine returns to-day, we shall expect to see a large attendance. Let every one go, if possible. There is always enough, and more than enough, at a State Fair to repay the expenditure of a few dollars and the day or two of time, which are necessary to see it.

SECOND DAY—ATTENDANCE, NEW ENTRIES, AWARDS, ETC.

The weather continued threatening yesterday until about the middle of the afternoon, but, notwithstanding this, there was a pretty good attendance at the Fair, especially in the afternoon. The receipts, however, were not heavy. Large additions were made in several of the departments to the stock on exhibition on Tuesday evening, but the display in others is much more meagre than could be desired. Should the promise of good weather which the sky offers at the time of this writing be made good to-day, there will doubtless be large crowds out at the Fair.

The railroad companies, we learn, are bringing great numbers of people from every portion of the State, the influx capitalward on the Central Ohio road having rendered necessary, as early as yesterday morning, the preparation of an additional quantity of half-fare tickets to supply the large demand in excess of what had been anticipated.

THE STOCK.

Except of sheep, as we have previously stated, the exhibition in this department is not very full. John S. Rarey, of Groveport, is on hand with "Cruiser" thoroughbreds and his little toys of Shetland ponies, scarcely larger than many of the dogs which run about our streets. They are perfect little Tom Thumbs, in their own pony way, and afford great delight to the juveniles who see them.

Old "Searcher," who was awarded the first premium yesterday among the aged roadsters, is a most inveterate old prize-taker. He has two or three times received prizes at previous State Fairs, but, of course, in different classes.

Among the exhibiters of Durham stock, we notice Hills and Jones, Delaware, 8 head; C. M. Clark, Springfield, 10 head; John Inlow, Springfield, bull, "Duke of Oxford;" and James Kinnard, Columbus, milch cows, etc. George Anderson, Painesville, has 11 swine, paragons of animated pork, of a breed from a cross between Leicestershire and Russia. The show in this class is quite meagre.

DOMESTIC HALL.

The additions to the exhibition in this hall yesterday were not equal in quantity to those in most of the others. We noticed that a number of articles of domestic manufacture and use were among those brought in since Tuesday evening, as flax, towel cloth, flannel, linen, rag carpets, etc.

In the articles ornamental, Miss Jane E. Heiser, Chillicothe, contributes some beautiful specimens of "cone work," and wax and pressed flowers. The "what-not" exhibited by Miss. Jennie Blake, of this city, of the same kind of work, is much admired. Two new entries of shell work, by Mrs. S. Lorer, Lebanon, and Mrs. C. Van Buskirk, Newark, are very handsome. The former has wrought her work in the form of beautiful picture frames, flowers, vase and slippers, while the latter shows a house and lawn complete. It is composed of fresh water shells from the Ohio canal, with wire fence surrounding it, and some thousands of paste-board shingles. The labor spent upon it must have been immense. We were informed last evening that Mrs. Van Buskirk is willing to dispose of it for a reasonable price. Mrs. Mary F. Scott, of Shadesville, in this county, has a little love of a bead-basket, and Mrs. H. Clemen, of this place, a nice bead lamp stand mat.

Lawrence Cain & Co., of Cleveland, have a case of artificial limbs. Their invention is a new one, and from its apparent simplicity seems quite meritorious. Of dentistry there are three cases—those of Dr. S. W. Ludlow (who shows three silver medals also, awarded for his continuous gum work,) and Beauman & Wear, of this city, and Brown & Dills, Piqua.

FINE ART HALL.

The pointed reminders contained in the JOURNAL of yesterday had the good effect of stirring up our citizens to lend the aid which they have so abundant means to do, in filling up this hall to a degree somewhat more nearly respectable. There yet is plenty of room for further contributions, and we expect to see the hall full before noon to-day. Among the nice things brought in yesterday we saw a large glass case of Wm. Blynn's, containing splendid specimens of silver table service; some beautiful pencil drawings, flower and leaf paintings, etc., by Miss Anna Thomas, Miss Josie Klippart, Miss Cutler, and Mrs. H. H. Kimball. Mr. John H. Witt also has some colored photographs taken at the gallery of M. Witt. Their joint efforts have produced some wonderfully life-like pictures. The former also exhibits some specimens of his portrait-painting from life. H. Murphy likewise contributes some fine colored photographs. Several new paintings have been brought in. A crayon drawing by P. W. Craddleford, shown by Mrs. Houston, and the specimens from the pencil and the brush both of Mr. A. Schrader, deserve especial attention for their distinctness of outline and almost perfect finish. One or two marine views by our townsman, Mr. Sirvault, lately deceased, though the works of an amateur, are really excellent.

Three pianos occupy the stand under the skylight in the center. They are exhibited by Fawcett & Co., Spohr & Selbach, and Chas. Minster, all of Columbus. Fine specimens of penmanship arrived yesterday from Duff's and the Iron City Commercial Colleges, both at Pittsburg.

FLORAL HALL.

This hall attracted many visitors yesterday. It will probably be rendered still more beautiful and, we hope, complete by additions to-day of articles previously entered, but detained while *en route*.

POWER HALL.

The exhibition of machinery, farm implements, etc., in Power and Mechanics' Halls, is very good, exceeding all other departments of the Fair probably in fullness and variety. The former has very nearly the whole of its space occupied, while the latter is crowded.

In Power Hall, Walter S. Phelps, of this city, exhibits a planing machine, and just south of the building John L. Gill & Son, have one of their sorgho mills, with an evaporator in a shed close at hand, and cane all ready for the press. J. Sedgebeer, of Painesville, Ohio, has several mills,—grist, corn, coffee and spice. One of them, which he calls the army and emigrant's mill, is made so as to be fastened on a wagon tongue, or any similar pole, and turned by two men. Machinery for the treatment of wool is shown by Thos. Stibbs, of Wooster. Machine beltings lie on the center stand from Bradford & Sharp, Cincinnati. Clover seed threshers, hullers, etc., are shown by Frederick Decker, Delaware, (a harvester also); M. A. Mansfield, Ashland; and John C. Birdsell, South Bend, Ind. Threshers come from Owens, Lane & Dyer, Hamilton, and the Dayton Machine Company. E. Remington & Son, Ilion, N. Y., have in operation Perry's American Horse Power; and also exhibit cultivator teeth, hay fork and pitching machine. A sweep and horse power from J. B. Pitts &

Co., Dayton, are near at hand. S. B. Nash, of Syracuse, N. Y., shows Bullard's Hay Maker.

New brick-making machinery, in small models, are exhibited by E. P. H. Capron & Co., Springfield, O., whose manufacture of diminutive bricks upon the ground attracts much attention.

A brick clay-grinder stands just without this end of the hall, from J W. Penfield, of Wiloughby, O. The turbine water-wheel of Stout, Mills & Temple, Dayton, is an admirable piece of mechanism. Wisewell's spoke and axe handle making machine is shown by Samuel Ensign, Trumbull county.

FARM IMPLEMENT HALL.

This hall, otherwise known as Mechanic's Hall, is the department towards which the practical agriculturists and mechanics who visit the Fair seem most of all to delight to throng. It contains a large and really fine display.

Almost any number of mowers and reapers are here, of which we can enumerate the following machines: Dutton's "Clipper" mower and "Ohio Chief" combined machine, by Bomberger, Wight & Co., Dayton; Dorsey's self-raking reaper and mower, and Brown's mower, by Pritz & Kuhn, also of Dayton; "Cayuga Chief," combined machine, and mower of the same designation, by Nixon & Co., Alliance; Hubbard's mower, by Younglove, Dewitt & Co., Cleveland; Ball's "Ohio" reaper and mower, and the "Ohio Jr." mower, by English, Helmick & Dixon, New Philadelphia; "Excelsior" self-raking reaper and mower, and mower alone, by J. F. Seiberling & Co., Massillon, O.; Wood's mower, and self-raking reaper, by Patrick Humphrey, Urbana; Manny's combined machine, and mower alone, by J. H. Manny Rockford, Illinois.

Plows, cider mills, corn shellers and planters, straw cutters, fanning mills, grain drills, cultivators, revolving and spring tooth horse rakes, and churns are here in numbers which forbid any attempt to specify them. There are various specimens of portable fencing; and from E. Nicholson, Cleveland, a patent carriage gate, a philosophical contrivance for opening and closing a gate without alighting from the saddle or carriage. G. C. Worth, Upper Sandusky, has a patent rain guard, and Hood, Fowler and Beery, Upper Sandusky, a stacking machine, and the uniquest little corn husker for the hand ever was. The Universal Clothes Wringer, at the east end, is in constant operation. Just without is a fruit drying oven by Lippy & Linn, Mansfield, O.

Columbus is repesented in the outer rows of shelves by a case of files from Hall, Ide & Co.; case of saws from James Ohlen; drain tiles by Wm. Miner; wooden eave-troughs by N. E. Lovejoy; a good display of marbleized slate, parlor mantles, stoves and furnaces, by Gorton & Aston; and cooking stoves by Stewart & Emery.

But the most attractive portion of the display in this hall to the eye, is that of the center stand. Here Columbus does itself honor. Smith & Conrad occupy a creditable space with a superb lot of fur robes, blankets, cloaks, etc., and a large case of military ornamentation, silver mounted pistols, etc. Their goods are very fine and many of them costly. F. H. Watt fills a space near by with a goodly assortment of trunks, traveling cases, etc. R. T. Cook shows a handsome carriage harness in a large upright case, and W. L. Starr an alarm door-bell. We took a "weigh" on Fairbanks' scales, brought by H. J. Ayer, and discovered a loss of six pounds since we began reporting a few months since.

The Novelty Saddle Works of Thomas J. Magruder, Marion, O., send some splendid specimens of workmanship, including a Somerset Shaftoe Saddle, and a Somerset hoop side-saddle, full quilted. Richard Thornton, of Cincinnati, has quite a large lot of buck and kid gloves. There are a large number of sewing machines in operation upon the center stands. We noted seven of the Grover & Baker machines, and eight of Wilcox & Gibbs' noiseless. Several Wheeler & Wilson's are here, and, also, Weeds, Finkle & Lyons', the "Florence" and the "Domestic" machines.

PRODUCE HALL.

This hall filled up very rapidly yesterday morning, and now the display of mammoth cabbages, onions, pumpkins and potatoes, the luscious bunches of grapes, and the inviting groups of magnificent great apples, pears, etc., leave no space unoccupied. There are some cunningly constructed beehives here, and from Mrs. John Ratcliff, of Zanesville, several cups of the most beautifully transparent jelly we have ever seen.

THIRD DAY—IMMENSE CROWDS—THE STOCK—AWARDS.

Yesterday was indeed a big day at the Fair. The number of people in attendance was immense, and though we heard no attempt made to estimate it, was doubtless eight or ten times larger than on either of the previous days. We did not learn the amount of receipts, but it must have been quite large. The weather was pleasant and all alike seemed upon their best behavior and doing their utmost to enjoy themselves. Two brass bands have been on the ground during each day of the Fair, Hemmersbach's German band and that from Camp Chase, their performance fully meeting the conventional demand for music upon such occasions. Viewed from one of the stands erected for the bands the shifting crowds yesterday formed a novel and picturesque panorama, comprising all sizes of humanity and garbs of every color.

In Floral Hall, Mrs., Geo. M. Parsons has done nobly for an amateur. She has quite a collection of green house plants in the east wing, among them a beautiful little lemon tree, with fruit ripening upon it, and elsewhere some cut flowers of exceedingly tasteful arrangement. Mrs. Isaac Eberly, also of this city, likewise contributes some very nice cut flowers, and Mrs. H. Coit, a very pretty specimen of imitation work. Mrs. W. R. Sprague, of Reynoldsburg, received numerous premiums yesterday, for her display of flowers.

In Domestic Hall, Mrs. S. A. Wiley, of Newark, was awarded a first premium for her shell work basket, etc. Mrs. Sarah Sirvault shows a good specimen of wax work flowers, and Mrs. Mollie O'Harra a fancy herb basket of unique materials, which almost every passer stops to examine.

Some of the fruit in Produce Hall is very fine, and the specimens of housewife manufactures in quality are good.

Henry Bishop, a colored resident of Clark county, is the only extensive, and, of course, the most successful exhibiter of poultry, upon the ground.

THE HALLS.

All the halls, especially the Floral, Domestic and Fine Arts, were a perfect jam all day, so that the fine things which they do contain could be seen only amid discomfort, and at the best very imperfectly. The dust in some of the halls became grieviously unpleasant in the afternoon, but we noticed that the Fine Art building continued free from it altogether.

Among the oil paintings in this hall is the picture which we noticed at some length in our local columns some days since—"Hard to Shoe," by E. F. Andrews, an amateur artist of Steubenville. Mrs. Col. McMillan contributes the "Beggar Boy," said to be a genuine Murillo. Theodore Lund, of this city, in the north wing has some good specimens of his work as a portrait and photograph painter. There are also fine colored photographs by A. F. Smith & Co., Columbus, and ten uncolored ones by Wm. Hadock, Circleville. The only piece of sculpture exhibited is brought by Mrs. Dr. Ide. It is a "Veiled Head," by Signor Motelli, a Milanese sculptor, and is a very artistic, beautiful thing.

THE STOCK.

The horse ring, of course, was the great center of attraction for thousands. In the positions most favorable for witnessing what was going on there, on the sides towards the halls, the crowds massed in a compact body several ranks deep. The track was in very much better condition than it seemed possible for it to become on Wednesday morning, but there were not any very exciting trials of speed. It is evidently not the design of the Board to permit this department of the Fair to degenerate into a mere series of horse races.

Visitors likewise thronged the stalls and pens, where admiring crowds all day long especially marked the localities of the monstrous draft horse

"England's Glory," of Rarey's diminutive ponies, and of the Cashmere goats, with their long white hair and beard, and venerable aspect.

The exhibition of draft horses is really excellent, and at the stalls were more examined and admired than any other class. It would be impossible for us to particularize the points of all the good horses on the ground, and there is, at any rate, no need to do so, when all may see and judge for themselves. Bellfounder and Bigelow stock are numerous. Some of the stalls, we may remark, display no cards from which the public may learn whose and what it is they are looking upon, and one of the principal ends of an occasion of this charcter is thereby frustrated, and certainly to the great disadvantage of the exhibiter.

In the department of horses, Franklin county exhibits well and largely. Columbus is represented in the books of entry by the names of David Williams, David Taylor, Wm. McDonald, George McDonald, C. Johnson, G. W. Williams, Lawrence Luckhaupt, J. P. Stockton, Lewis Krob, F. C. Weatherby, F. Raymond, S. D. Kinnard, and perhaps some others. The county outside of Columbus, shows stock, among others belonging to Wm. H. Rarey, John Swisher, James McKalvey, Francis Jones, John Jones, E. A. Fuller, N. Van Loon, J. M. Morgan, Wm. Irwin, Dennis Ryan and C. H. Newell. Pickaway county shows horses from J. N. Denney, J. H. Fickhardt, C. L. Don, S. A. Campbell, etc.; Licking county from J. L. Tyler, Chas. Stewart, etc.; Delaware county from Jesse B. Mecay, R. Cook, D. P. Cook, etc.; Union county from Chas. Fullington, (splendid animals—draught horses) John Hall, J. E. Hammond, Dr. J. O. Baker—all of Milford Center, and from Stephen Spooner, (who shows the original "Bigelow" stallion, a magnificent specimen of the English draft horse.) Other counties in Central Ohio send such stock as that belonging to Wm. A. Neal, London; Wm. Wellword, Pleasant Valley; Samuel Pugh, Amanda; Hugh Bell, Chillicothe; Commings & Shaw, Springfield, and Andrew Boughton, Mansfield. Northern Ohio dealers are represented by Albert Ely, Elyria; George W. Bierce, Cleveland, and perhaps one or two others.

Jacks and jennies are shown by Wm. McDonald, of this city; A. D. Rogers, Franklinton; John Kinney, South Charleston; and three or four others. Very few mules are here, of whose owners we obtained but the name of Jacob Fisher, Zanesville.

Many of the cattle on exhibition are very fine. The Stock brought by Daniel McMillan, of Xenia, well deserve the ribbons with which they were yesterday so liberally adorned. The animals shown by Inlow and by Clark, whose stock we specified yesterday, are splendid. Among the exhibiters in this department, whose names we have not before given are G. C. Palmer and G. M. Coulter, Reesville, and R. Baker, Avon.

The unprecedentedly large and excellent exhibition of sheep we have fully spoken of in previous issues. A more difficult task has rarely fallen to the lot of an awarding committee, than has devolved upon the judges of wool at this exhibition.

Several pens of long wool sheep have come in since the Fair opened. Among others, from Wm. Matthews, Etna, Licking county; T. P. Vergen, Delaware; Wm. Weymott, Cedarville; Thos. McFarland, Thomas Aston, and S. Toms, Elyria. The sheep raisers of Licking county are well represented here. J. N. Wright, of Hartford, in that county, has several pens of Spanish merinos, among the lot 12 ewes, whose clip at the last shearing averaged a fraction over twelve pounds each. Geo. W. Pollock, of Gratiot, has three pens. Theodore Leonard and Jared Foresman are Columbus exhibiters in the sheep line. Geo. Lewis, Worthington; Hills Jones, Delaware; T. J. Hill, Cornwall, Vt., and D. J. Twichell, Middlebury, Vt., are among the exhibiters whose names we have not before published in speaking of this department.

CLOSING DAY—THE FAIR AS A WHOLE.

Except for the almost intolerable dust, as well in the halls and elsewhere on the grounds as in the streets leading to the latter, yesterday, the closing day of the Fair, was very pleasant, the weather being still more favorable even than on Thursday. There were not nearly the same number of visitors in attendance, however, nor indeed was it reasonable to anticipate that such would be the case. On that day, there were about 35,000 people present, the receipts at the gates reaching nearly $8,000.

For large masses of the crowd, the horse ring continued to present the chief attractions in interest rather exceeding even the preceding day. Some beautiful driving was done in the contest for sweepstakes, but no exciting racing occurred. The ladies' equestrian performance in the afternoon was not an extensive affair, there being but two actual competitors on the track.

Our record of the Fair would be incomplete without especial mention of the splendid display of wool by Geo. W. Pollock, Gratiot, Licking Co., comprising 81 very fine fleeces, the product of two families of sheep in his extensive flocks. No premium had been offered for anything of this kind, but the awarding committee in the appropriate class made special and most highly favorable mention of it in their report.

The excellence of the large lot of Durham cattle exhibited by Messrs. Hills & Jones, of Delaware, is better told by the list of awards than by anything we can say.

In the halls there was a much better opportunity for seeing the display than on Thursday, on account of the throng being so materially less; and the committees having completed their awards, the red and blue cards attached to the premium articles added new interest to these departments.

Domestic and Fine Art Halls were filled all day with spectators. The efficient superintendents of the halls, Messrs. Protzman and Fisher respectively, have at least the satisfaction of knowing that their efforts have been appreciated, and that the display in the departments entrusted to their supervising care was very good, so far as it went, and called forth the constant admiration of the beholders. We have before noticed the beautiful specimens of penmanship which were on exhibition in Fine Art Hall from Bryant, Stratton and Felton's Commercial College, at Cleveland. The elegance and careful finish of these productions speak well for the characrer of one at least of the Forest City's educational institutions. An examination of the text books, which were also at the Fair, published and employed by the conductors of the College was, to our mind highly confirmatory of this favorable opinion.

About three P. M. the exhibition virtually closed, and the removal of stock, and articles from the halls began. By five o'clock nearly all the stalls and many of the pens were tenantless, the halls were completely dismantled, officers and committees had gone up town, many of them were already en route homeward, and the 15th Annual Ohio State Fair was over. Though by no means a failure, it was not the exhibition it should have been, and might have been, with a proper display of enterprize and public spirit by the classes which must always be relied upon to fill and furnish forth the exhibition tables at an industrial fair. There were some noble exceptions of course, but, speaking generally, these remarks come to the citizens of Franklin county, and of Columbus, most closely of all.

We are gratified, however, to learn that the Fair was financially a decided success. The gross receipts this year were between $12,000 and $13,000, against $11,000 received last year at Cleveland. So much for the advatages of a central location. In consequence of the vastly enhanced cost this year of labor and material necessary to fit up the grounds, it is not probable, however, that the surplus remaining in the Treasurer's hands, after all demands have been met, will equal that of last year.

[Special Dispatch to the Cincinnati Gazette,]

COLUMBUS, September 13.

As is usually the case on the first day of State fairs, the principal business at the grounds to-day was receiving entries, and bringing order out of chaos. By to-morrow the articles in the different halls will be more suitably arranged for exhibition. The attendance has been comparatively small, but will be greatly increased to-morrow, as will also the receipts, which to-day amounted to only $1,000. Some departments are well represented, while others are but moderately so. It is the concurrent testimony of those who should know, that the display of sheep has never been excelled in the west. There are some splendid specimens from Vermont. The show of cattle equals that of last year, and while there are fewer horses they have the merit of being better in quality. There are agricultural implements in abundance, but little machinery, and not the usual quality or variety of mechanical and domestic products. The agricultural, horticultural, floral and fine art halls are very defective, owing in a good part to the citizens of Columbus and Franklin county, who have almost entirely neglected the last named hall. As there are a large number of articles known to be on the way for exhibition, it is altogether probable that a great improvement will have taken place in some of the departments by to-morrow night, so that Thursday will see the Fair in its most favorable aspect. The people will not lack for amusements while here. The Italian Opera is in full blast at the new hall in Union Block, and also Ellsler's Atheneum and sundry side shows.

Great Union meetings will be held to-morrow and Thursday evenings in front of the west entrance in the Capitol.

The wool-growers will meet in the Senate Chamber to-morrow at 7½ o'clock P. M.

THE EXHIBITION—WOOL-GROWERS' DISCUSSION—POLITICAL OPINIONS OF THE FARMERS.

[Special Dispatch to the Cincinnati Gazette.]

COLUMBUS, September 14.

The State Fair is distinguished this year for the best exhibition of sheep ever made in this country, and equal to any in the world. There is also a superior display of agricultural implements and machines.

The wool-growers held a conference this evening, and discussed the questions whether it was advantageous to breed extremes, such as very fine with very coarse wool, and whether in-and-in breeding was detrimental to the stock.

S. S. Matthews of Licking, Dr. Caldwell, C. W. Montgomery, Presidents of the Association, H. R. Pomford, of Licking, Mr. Griswold of Vermont, Mr. Alexander of Summit, Mr. Willis of Madison, and others, participated in the discussion.

The general opinion was, that it was desirable to avoid extremes in breeding, and that to successfully breed in the same family required extraordinary attention to render it safe.

I have conversed with several gentlemen from various parts of the State in reference to the crops, and find the wheat has been less than half an average, grass an average, oats extra, while the corn promises to be a full crop.

Stock hogs are scarce, and while they are selling at 8 cents in the southwest part of the State, in all other portions they are worth 10 cents per pound. The farmers generally are putting in more wheat than usual this fall. I have also sought political information, and find a most hopeful spirit prevailing among all the truly loyal people.

[Special Dispatch to the Cincinnati Gazette.]

COLUMBUS, September 15.

The third day of the State Fair has passed, greatly to the satisfaction of all concerned. The attendance yesterday, as compared with the second day last year, was very light, and the prospect was blue to the financiers, but to-day there has been an immense attendance, and the receipts have reached $10,000. The police regulations have thus far preserved the best order, only one complaint having been made of pocket picking, and the offender, a woman, was arrested. Ample arrangements were made for feeding the multitude at very liberal prices, and taken altother, the Fair has been engineered with great ability. In some respects the Fair has been quite inferior, but in the most important departments it is a decided improvement. The sheep alone are enough to save its reputation, as was seen to-day in the numerous sales at high figures that have been made. In agricultural implements and machines we observe an unusual number of new patents, showing that industrial progress has even strengthened itself during the war.

In the show of fruit there is as much as could be expected, as the season has been unpropitious, and the National Pomological Society, in session at Rochester, takes away many of our fruit-growers. But the department is by no means without interest. J. Austin Scott, of Lucas county, Ohio, is on hand with no less than 132 varieties of excellent apples. He would have gone to Rochester, but for his State pride in patronizing this Fair. George Powers, of Wood county, displays twenty-five varieties of splendid pears. He shows a cluster of five on one stem of the Duchess D'Angouleme, that weigh more than half a pound each, and several clusters of the Bonne De Jersey that prove the thoroughness of his cultivation. He grew them on dwarf trees. Bateham and Hanford, of Columbus, have 70 varieties of pears. F. C. Weatherby, of Columbus shows ten varieties of very fine apples and H. C. Noble and Wm. Merion, of this city, also contributes nice samples. C. Manning, of Harrisburg, Franklin county, shows seventy varieties in grapes. Among the largest exhibiters are A. Pfeifer & Son, of Cincinnati, who have forty-one varieties, and take the first premiums for the best six, and second premium for the best three varieties, and also, the first premium for the best seedling, and the first for the best general collection. Morrison, Bell & Co., of Portsmouth, O., have twenty-two varieties at the Fair, out of the fifty-four which they are growing. Their principal object was to show the very fine Delaware vines which they have grown from the slip this season, and which attract marked attention. The finest Isabellas are exhibited by Samuel Kock, of Louisville, and Jacob Young, of Columbus. In the display of agricultural products, there is nothing remarkable. On the whole, this Fair is a success.

[Special Dispatch to the Cincinnati Gazette.]

COLUMBUS, September 16.

The Fair closed to-day to the satisfaction of all concerned, except those who think they should have got premiums. The receipts amount to about $12,800. The people of Columbus regret their neglect, and promise to do better next time. There was one thing remarkable about this Fair, and that is the fact that but one case of picking a pocket occurred on the grounds. The offender in this instance was promptly arrested. This good record is owing to the vigilance of Capt. F. Dewitt, of Columbus, assisted by the following well-known detectives: M. D. Brooke, of Newark; Thos. Kinstry, Cleveland; Larry Hazen and Sam. Payliss, of Cincinnati, all of whom received the thanks of the Board.

Only one serious accident has taken place, which was the killing of a little child at the depot this afternoon.

CATALOGUE OF BOOKS IN LIBRARY OF THE STATE AGRICULTURAL SOCIETY.

Annals of Congress. 1799 to 1824, inclusive.
Annals of Science. Vol. 1.
American Short Horn Herd Book. Vols. 1, 2, 3, 4, 5, 6.
American Kitchen Gardener.
Agricultural Chemistry.
American Cattle Doctor.
Agriculture and Domestic Animals.
American Archives of 1774, '5 and '6, in 9 vols.
American Shepherd.
American Weeds and Useful Plants.
American Institute Transactions of 1846 to 1860, inclusive.
Blodget's Climatology of the U. S.
Cyclopedia of Agriculture. Vols. 1 and 2.
Colman's Practical Agriculture and Rural Economy.
Colman's Practical Agriculture.
Commercial Relations. 1861 and '2.
Commerce and Navigation. 1850-2-3 and '61.
Cultivator. Vol. 1 to 10, inclusive.
Cultivator. 1850 and '51.
Coate's Herd Book. Vol. 1 to 15, inclusive.
Cranbery Culture.
Chemical Field Lecture.
Complete Farmer and Gardener.
Connecticut State Agricultural Reports. 1854 to '59, iclusive.
Cutbush's Chemistry. Vols. 1 and 2.
Chaptal's Agricultural Chemistry.
Congressional Globe. 1859 and '60.
Diptera of North America.
Dana's Mineralogy.
Domestic Animals.
Every Lady her own Flower Gardener.
Elements of Agricultural Chemistry and Geology.
Elements of Agriculture.
Executive Documents. (U S.)
Farmers' Magazine. Vols. 1 and 2.
Flint on Grasses.
Family Kitchen Gardener.
Farm Drainage.
Field Notes. 1861.
Family Visitor. Vol. 1.
Grape-growers' Guide.
Guenon on Milch Cows.
Hawes' Ohio Gazetteer and Directory.
Hints to Horse Keepers.
Hind's Farriery and Stud Book.
History of Franklin County.
Insects Injurious to Vegetation.
Iowa State Agricultural Reports. 1857-8, '61-2 and 3.
Indiana State Agricultural Reports. 1852-3-4-5-6-7-8-9 and '60.
Illinois State Agricultural Reports. 1853 to '60, inclusive.
Journal of the Royal Agricultural Society. Vol. 2 to 24, inclusive.
Journal of Agriculture. 1853 to '63.
Journal of the Bath and West of England Society. Vols. 7, 8, 9 and 10.
Journal and Documents of Delegates of 1835-6-7-8 and 9.
Kentucky State Agricultural Reports. 1856-7-8-9.
Landscape Gardening and Rural Architecture.
Loudon's Encyclopœdia of Agriculture.
Land Drainage. (Klippart.)
Loudon's Aboretum et Fruiticetum Britanicum.
Landscape Gardening, Parks and Pleasure Grounds.
Lectures on Practical Agriculture.
Laws of Ohio.
Morse's Gazetteer.
Massachusetts State Agricultural Report, Vols. 1, 2, for 1853, '54, '55, '57, '58, '61, '62, and '63.
Michigan State Agricultural Report, 1849, '50, '51, '54, '55, '56, '57, '58 and '59.
Mysteries of Bee Keeping.
Miles on the Horse Foot.
Muck Manual.
Munn's Practical Land Drainer.
Morgan Horses.
Maine State Agricultural Report, 1853 to 1862, inclusive.
North Eastern Boundary Arbitration.
Norton's Scientific Agriculture.
New Hampshire State Agricultural Report, 1850 to 1859, inclusive.
New York State Agricultural Report, 1841 to 1863, inclusive.
North American Coleoptera.
Ohio Cultivator, 1845 to 1860, inclusive.
Ohio State Agricultural Report, 1846 to 1863, inclusive.
Owen's Geological Survey of Wisconsin, Iowa and Minnesota, Vols. 1 and 2.
Ohio Farmer, 1859 to 1863, inclusive.
Patent Office Report, Mechanics', 1850 to 1860, inclusive.
Patent Office Report, Agriculture, 1849 to 1861, inclusive.
Patent Office Report, Mechanic and Agriculture, 1845, '46 and '47.
Pennsylvania State Agricultural Report, Vols. 1, 2, 3, 5 and 6.

Practical Treatise on the Culture of the Grape.
Principles of Agriculture.
Revised Statutes of Ohio, Vols. 1 and 2.
Reports of the Juries, 1851, (World's Fair, London.)
Report of the Finances, 1849 to 1861.
Report of the Military Academy.
Rural Architecture.
Rural Affairs.
Revised Statutes of Ohio (Curwen), Vols. 1, 2, 3 and 4.
Report of the Department of Agriculture.
Smithsonian Catalogues.
Smithsonian Contribution to Knowledge, Vols. 1 to 13, inclusive.
Strawberry Culture.
Saxton's Rural Hand Books, Vols. 1, 2 and 3.
Smee on the Potato.
Stephen's Book of the Farm, Vols. 1 and 2.
Senate Results of Meteorological Observations, Vol. 1.
Senate Commercial Relations, Vols. 1, 2, 3 and 4.
Senate Documents, (U. S.)
Sheep Husbandry.
Statistics of the U. S., 1830, '40, '50 and '60, (Census.)
The Farmer's Library.
The Horse: in the Stable and in the Field.
The National Almanac.
Transactions of the Agricultural Society of Scotland, 1855 to 1863, inclusive.
The American Agriculturist, Vols. 1, 2, 3, 4, 16 and 17.
The Cultivator, 1844, '45, '46, '48, '49, '50, '52 to '64, inclusive.
The Progressive Farmer.
The American Poultry Yard.
The Cottage and Farm Bee.
The American Bee Keeper's Manual.
The Rabbit Fancier.
The Modern Horse Doctor.
The Field Book of Manures; or, The American Muck Book.
The American Gardener.
The Vine Dresser's Manual.
The Farmer's Land Measurer.
The Farmers' Cyclopœdia of Modern Agriculture.
The Plow, Loom and Anvil.
U. S. Coast Survey, 1854, '55 and '56.
Webster's Dictionary.
Wisconsin State Agricultural Report, 1851, '52, '58 and '59.
Wisconsin Farmer, Vol. 2.
Weeks on Bees.
Western Agriculturist, Vols. 1 and 2.
Walks and Talks of an American Farmer in England.
Yount and Martin on the Hog.
Yount and Martin on Cattle.
Year Book of Agriculture, 1855 and 1856.

COUNTY SOCIETIES—OFFICERS, ETC.

County.	President.	Treasurer.	Secretary.	Place of Fair.	Time of Fair.	Receipts.	Expenditures.
Ashland		J. B. F. Lampsel	W. B. McCarty	Ashland		$1,000 60	$813 63
Ashtabula	Jas. P. Jennings	J. D. Ensign	C. L. Bashcoll	Jefferson	Sept. 6, 7, 8, 9	792 29	755 90
Athens	W. P. Johnson	N. H. Van Vorhes	Geo. Putnam	Athens		917 72	645 54
Auglaize	H. T. Rinehart	O. T. Dieker	C. P. Davis	Wapakonnetta	Oct. 19, 20	253 73	89 63
Belmont	J. M. Mitchell	James A. Rinker	John Dunham	St. Clairsville	Sept. 20, 21, 22	543 40	447 75
Brown	P. L. Wilson	F. J. Phillips	J. H. Ring	Georgetown	Sept. 6, 7, 8, 9		
Carroll	J. L. Harsh	Wm. Thompson	Robert Raley	Carrollton	Oct. 4, 5, 6	478 00	
Champaign	N. H Harr	E. G. Wiley	John Russell	Urbana	Sept. 27, 28, 29, 30	1,127 44	1,077 38
Clark	A. Waddle			Springfield	Oct. 4, 5, 6, 7	2,184 75	1,313 28
Clermont	John H. Branch	W. C. Dole	W. E. Means	Boston	Sept. 6, 7, 8, 9	1,500 00	
Clinton	C. Linton	W. Crumly	L. C. Walker	Wilmington	Sept. 21, 22, 23	1,419 10	1,300 48
Columbiana	D. Harbaugh	B. W. Pritchard	B. F. Nichols	New Lisbon	Sept. 23, 24, 25		
Coshocton	J. Meskimen	M. Johnson	G. G. Ridgely	Coshocton			
Cuyahoga	N. C. Baldwin	W. Waterman	S. D. Harris	Cleveland	Sept. 27, 28, 29, 30	1,650 36	1,239 30
Delaware	R. McKinnie	C. B. Paul	J. D. Van Deman	Delaware	Sept. 28, 29, 30	1,276 30	1,229 85
Fairfield	U. C. Rutter	J. L. Tuthill	W. L. Rigley	Lancaster	Oct. 12, 13, 14	934 25	938 68
Fayette	J. N. Beatty	J. W. Cleveland	M. Willard	Washington		1,386 25	1,226 25
Franklin	J. Forsman	J. M. Pugh	C. S. Glenn	Columbus	Oct. 4, 5, 6, 7	1,251 49	1,343 72
Geauga	Thos. Carroll	G. Boughton		Burton	Sept. 20, 21, 22	1,067 79	
Greene	D. McMillan	W. F. Pelham		Xenia	Sept. 7, 8, 9	1,262 95	1,163 53
Guernsey	H. Broom	S. Potts	R. D. Rood	Cambridge	Oct. 5, 6	414 51	361 50
Hancock		Henry Byal	D. B. Beardsley	Findlay	Oct. 6, 7, 8	412 93	342 09
Hardin	J. C. Stevens			Kenton			
Harrison	A. Jamison	J. M. Robinson	J. Jarvis	Cadiz	Oct. 5, 6, 7		
Highland	J. M. Trimble			Hillsboro	Oct. 5, 6, 7	1,091 78	1,154 46
Huron	A. Brightman	C. A. Preston	Geo. W. Knapp	Norwalk	Sept. 28, 29, 30	1,818 06	1,624 14
Jackson	G. Thompson	W. B. Steele	J. A. Sell	Jackson	Oct. 6, 7	391 52	335 35
Lake	C. L. Hoyt			Painesville		1,138 52	916 07
Licking	David Smith		W. Taylor	Newark	Oct	2,012 07	
Logan	Amos Gore	W. V. Marquis	J. Pollock	Bellefontaine	Oct. 4, 5, 6, 7	517 47	509 16
Lorain	A. B. Gates	M. Galluss	M. Galluss	Elyria	Oct. 5, 6, 7	1,403 23	1,195 82
Lucas	Wm. Rawle	G. Norton		Toledo		663 58	334 07
Madison	Robert Boyd	P. Peetrey	H. Toland	London		734 97	534 01
Mahoning	Geo. Pow	Hosea Hoover	J. J. Moore	Canfield	Oct. 4, 5, 6	1,363 74	1,300 48
Marion	D. Pettit	A. D. Woolley	J. E. Davids	Marion	Sept. 28, 29, 30	500 67	

Medina	W. H. Ritter	J. Hayslip	J McCormick	Medina		1,357 45	1,135 76
Miami	Wm. R. McLung	C. H. Culbertson	G. W. Morris	Troy	Oct. 5, 6, 7, 8	849 13	846 13
Morgan	J. B. Stone	F. Sill	H. Dunsmon	McConnelsville	Oct. 18, 19, 20	598 05	488 99
Morrow	A. H. Wrenn	E. P. George		Mt. Gilead		687 88	694 50
Muskingum	J. Buckingham	V. Best	F. A. Seborn	Zanesville	Sept. 27, 28, 29, 30	2,955 25	2,920 74
Noble	C. Phelps	S. Danford	W. M. Stewart	Sarahsville	Oct. 20, 21		
Pickaway	Z. H. Perrill	J. Boyer	H. B. Denny	Circleville	Sept. 21, 22, 23	1,115 25	661 75
Portage	Fred. B. Cannon	A. H. Parsons	S. D. Norton	Ravenna	Sept. 21, 22, 23	336 17	190 71
Preble	H. W. Dooly	J. S. Morris					
Putnam	J. Maidlow		D. McCurdy			315 25	189 11
Richland	B. S. Runyan	H. P. Davis	H. C. Hedges	Mansfield	Sept. 7, 8, 9	654 45	654 62
Sandusky	J. L. Greene	J. P. Moore	O. W. Vallette	Fremont	Oct. 26, 27, 28	581 40	534 83
Seneca	T. H. Bagby	A. G. Sneath	J. T. Huss	Tiffin	Sept. 26, 27, 28, 29, 30		
Shelby	E. Lytle	J. Duncan	A. B. C Hitchcock	Sidney			
Stark	L. Raber	C. Aultman	W. H. Alexander	Canton	Sept. 28, 29, 30	1,683 94	1,335 46
Summit	H. P. Cannon	G. D. Bates	J. P. Alexander	Akron	Oct. 5, 6, 7	2,025 10	1,126 91
Tuscarawas	U. C. Deardoff			Dover	Sept. 28, 29, 30, Oct. 1	1,162 72	874 74
Union	R. D. Reed	S. S. Jewell	S. C. Lee	Marysville	Oct. 5, 6, 7	730 00	294 55
Warren	J. M. Roosa	W. F. Parshall	W. B. Sellers	Lebanon	Sept. 28, 29, 30, Oct. 1	3,308 20	
Washington	G. Dance					579 77	576 93
Wayne	J. G. Troutman	J. McClellan	A. Wright	Wooster	Sept. 28, 29, 30, Oct. 1	1,279 03	1,034 87
Wyandot	T. V. Reber	W. Hedges	W. H. Jones	Upper Sandusky	Oct. 18, 19, 20	715 38	380 05

ABSTRACT OF REPORTS OF COUNTY SOCIETIES.

ASHLAND COUNTY.

In view of the unfortunate condition of the country during the past year, and the pendency of a draft last fall, it was considered best by the Board to postpone the annual exhibition of the Society until next fall. The society numbers two hundred and thirteen members.

The agricultural products of the county will, perhaps, compare favorably with those of last year. The wheat was considerably winter killed; the oats an average crop, though the straw was short; the corn crop was unusually large, but owing to the prevalence of exceeding moisture during the latter part of the season did not ripen well, leaving a large amount of soft corn in the county.

The scarcity of labor seriously affects the agricultural interest in amount of products, which is compensated to the producer by increased value.

ASHTABULA COUNTY.

The Ashtabula county Agricultural Society, held its annual fair for 1864, on its fair grounds in Jefferson, September 6th, to the 9th.

In view of the very cold, wet and backward spring, and the extreme drouth of the summer, many of the friends of the Society thought the time fixed was too early in the season; still the managers decided to risk the result, rather than change the time, and such being the interest felt throughout the county in these wholesome and useful gatherings, the list of entries compared well with former years, and the show was fully up to the average, if not exceeding former exhibitions.

The fair was honored with the presence of, and with a most splendid speech from Gen. J. A. Garfield, the honored Representative of the 19th District, and notwithstanding the day of the address, the rain literally poured incessantly all day, the attendance was good, and but for the rain of that day, the attendance at the fair would have exceeded anything ever known at any previous fair in Ashtabula county.

The list of premiums offered was so arranged that awards could be made to a large number of competitors in the several classes; there having been awarded eight first premiums and seven second, for farm crops and seeds; twenty-four first premiums and twelve second, on horses; six first premiums and four second, on short-horned cattle; three first premiums on Devon cattle; twelve first premiums on other kinds of cattle, including sweepstakes, and four second; two first premiums on swine and poultry.

The show of sheep was large and very fine, and were divided into the following sub-classes: Long wool, fine wool, South Down and grades. Thirty-two first premiums on sheep, and twenty second; twenty-four first premiums and fourteen second, on vegetables; five first premiums and four second, on fruits; three first premiums and one second, on farm implements; eight first premiums and two second, on harness, boots, shoes and leather; three first premiums on furniture.

Geo. Hall, Esq., had on exhibition a splendid display of musical instruments, adding thereby, very greatly to the interest of the fair.

Eleven first premiums and nine second, on machinery and mechanical products; forty-three first premiums and twenty-one second, on bread, flour, sugar, prèserves, etc.; three first premiums and three second, on dairy products; nine first premiums and thirteen second, for domestic manufactures; twenty-seven first premiums and thirty-one second, on fancy needle work; nine first premiums and six second, on flowers; twenty-eight first premiums and three second, on fine arts and ornamental work; one first premium on sewing machines.

The reports and statements of competitors for farm crops were duly attested and certified.

The society now has 209 members, fine and commodious grounds, comfortable buildings, and is virtually free from debt, sharing the confidence and co-operation of a fair proportion of the inhabitants of the county.

While the county or parent society congratulates itself, in view of its past successes, and feels animated with its prospects, it would most respectfully allude to and recognize all auxiliaries in Ashtabula county. There are three societies known as Ashtabula Farmers' and Mechanics' Association, Conneaut Fair, and Orwell Fair, each of which is in a most prosperous condition, and which the county society would cordially hail, these and any other societies for the advancement of agricultural and mechanical interests, still it does deprecate anything looking like an effort to rival or distance the parent organization.

During the past season agricultural interests have suffered from the wet backward spring; also from the extreme drouth of summer, while the wire worm has made sad havoc with corn crops and some other crops in many portions of the county. The potato bug, too, has visited us and done some damage.

The growing of flax and sorghum is receiving great attention among the people; wool growing, horse breeding, mule rearing, cattle and pork producing, are sharing more and more largely the attention of the people, while the raising of grain and making butter and cheese are not in the least losing ground.

The hay crop for the past season was very light, and so was the wheat, owing in part alike to the severe winter of 1863–4, and the unfavorable season following.

Something like an approximation of the kinds of crops raised in this county and the amount of each, with the average yield, may be gathered from the reports as summed up in the auditor's office, which of course is the result of the yield of 1863:

Corn about 375,000 bushels, 42½ bushels per acre; oats, 228,500 bushels, 27 bushels per acre; wheat, 100,000 bushels, 10 bushels per acre; potatoes, 175,500 bushels, 116 bushels per acre; hay, very light; tobacco, 200,000 pounds, 1,000 pounds to the acre; butter, 1,000,000 pounds; cheese, 3,000,000 pounds.

AUGLAIZE COUNTY.

Our society organized on the first day of January, 1864, by electing a president, vice president, secretary, treasurer, and six managers; and at a meeting of the board they formed and adopted a constitution and code of by-laws. One dollar was the initiation fee required to become a member. There are 132 members in the society at present.

The principal crops raised in this county are wheat, corn, oats and hay, and some barley and flax-seed. Owing to the remarkable cold weather and extremely sudden changes in the weather of last winter, the wheat and barley were generally winter killed, and consequently the general yield or average was very light, not to exceed from 8 to 10 bushels per acre of wheat and about 20 of barley.

The corn and hay were also light crops, owing to the drouth in the early part of the season. The average yield of corn was about 25 bushels per acre, and hay from a ton and a quarter to a ton and a half.

The early planted potatoes a light crop, but keep well; the late planting a full average yield, but do not keep well.

Peaches, pears, plums and grapes, almost an entire failure.

Apples about an average crop as to quantity, but the quality hardly as good as usual, owing to the drouth in the fore part of the season.

Considering the infancy of the society and the disturbed condition of the country, and various other disadvantages under which the society and its officers labored, we had a very respectable county fair, a good attendance and considerable interest manifested.

BELMONT COUNTY.

The Sixteenth Annual Fair of the Belmont County Agricultural Society was held, at St. Clairsville, on the 20th, 21st and 22d days of September, 1864.

The exhibition compared favorably with former years; deficiencies, however, were noticeable in some of the departments. Notwithstanding the excited state of the country the usual interest was manifested by those in attendance.

At this, as at all former exhibitions, the horse ring appeared to be the grand centre of attraction, at least to a great portion of those present; and we think Belmont is not behind her neighboring sisters either in the number or quality of her good horses. Other portions of the stock department were not so fully represented as usual.

The ladies of this county deserve great credit for their skill and industry in preparing the many nice things which they exhibited in the Manufacturers' and Floral halls.

The number of members the present year is 210.

The principal crops raised in our county are wheat, corn, oats, barley, potatoes, hay and sorghum; with a small amount of most other varieties of grain and vegetables raised in Ohio. A severe freeze, when the ground was very wet, which occurred in eastern Ohio about the first of January, 1864, was very injurious to our wheat crops, and consequently the average yield is small, not more than 8 bushels per acre. The spring crops also suffered from dry weather in the early part of last summer.

Corn will probably average 40 bushels per acre; oats, 32; barley, 30; potatoes, 150; hay, 1½ tons; sorghum, 120 gallons, &c.

The potato crop was materially injured by rotting, some lots being entirely worthless; new varieties were not so much affected as older ones.

Sorghum molasses has within a few years become an important article in our agricultural productions; enough being produced to supply the demand for home consumption.

BROWN COUNTY.

Our Fifteenth Annual Fair was held, at Georgetown, on the 6th, 7th, 8th and 9th of September, 1864. The exhibition lists, although not quite so large as formerly, did exhibit a fine display of economy, industry, mechanical skill and wealth. All classes of stock in our county show manifest improvement. The show of horses, cattle and sheep, could not be easily surpassed any where. Sheep—Merinoes, Cotswold and Southdowns were on exhibition. Farmers' and Mechanics' departments well filled. The exhibition of domestic manufactures could not be surpassed. The floral hall was exceedingly well filled with every thing that the fine taste of our ladies could suggest. In fine, our fair was a complete success. Our society has labored under disadvantages in consequence of debts necessarily contracted for improvements. The economy and good management of the board have relieved us of this incubus. Our members number 395. Wheat, corn, oats, potatoes and tobacco, principal crops.

Wheat, below average, winter killed; corn, short, drouth; potatoes, short, drouth; oats, good; tobacco, short, drouth; fruit, failure, winter killed.

CARROLL COUNTY.

The society has been in a more flourishing condition the present year than for many years. The number of members is 278. The annual fair was held on the Agricultural Society grounds near Carrollton, on the 4th, 5th, and 6th days of October, 1864. The weather was not very fine, but in spite of a dashing rain, there was as large an attendance as common in this county. The receipts were but $478 00, but that sum more than paid all premiums and expenses. The balance, together with the aid of what the county treasury will furnish, will be sufficient to make considerable repairs to the grounds.

The sheep and wool growers seem to be the most interested in the improvement of their stock. The display of Spanish sheep would do credit to any county in the State. The whole flocks are improving rapidly, and it is quite common for flocks to average four and five pounds of wool to the sheep.

The principal crops raised in this county this year are wheat, corn, oats, barley, rye, buckwheat, flax, hay, and potatoes. Wheat was almost a failure on account of the severe winter—not more than one-fourth of a crop. Many fields were plowed up and sowed in oats, or planted in corn last spring. Corn, quite a good crop, much above the average, on account of the drouth in July and August. It was late getting ripe, and some of it is quite soft. Oats, an average crop; in part of the county very good; all very sound and heavy. Barley, not quite an average crop; drouth injured it. Rye, quite good; not injured by freezing out, as the wheat was. Buckwheat, very good crop; a great many acres raised on account of the failure of the wheat crop. One man, John Price, counted 2,200 grains of buckwheat on one stalk. Flax, good crop; much raised, and a very great amount being manufactured by hand to take the place of cotton goods; almost every family hunting up their old spinning wheel. Potatoes, an extra crop; very large and fine; in some places rotting slightly. Hay, average crop; clover hay very good; timothy hay injured by drouth.

Estimate of the crops raised and yield per acre, Carroll county, 1864.

	Acres sown.	Bushels produced.	Average yield per acre.
Wheat	20,000	60,000	3
Corn	10,000	400,000	40
Oats	15,000	540,000	36
Barley	500	5,000	10
Rye	3,000	40,000	16
Buckwheat	2,000	30,000	15
Flax	1,500	18,000	12
Hay	20,000	30,000 tons.	1½ tons.
Potatoes	600	90,000 bush.	150 bush.

CHAMPAIGN COUNTY.

The fourteenth annual fair was held on the Society's grounds near Urbana, on the 27th, 28th, 29th, and 30th days of September, 1864.

The weather was quite unfavorable, being rainy and cool, in consequence of which many were unable to attend who would otherwise have done so. The attendance, however, considering the weather, was very good.

The display in some of the departments—especially the Floral, and Products of the Farm, Dairy, &c,. was perhaps never excelled in our county. The mechanical department was sadly deficient, but we account for that *in part* by the unfavorable state of the weather.

The principal crops raised in this county are wheat, corn rye, oats, barley, buckwheat, and potatoes, all of which, except buckwheat, produced rather above an average crop.

CLARKE COUNTY.

The Clarke County Agricultural Society held their Twelfth Annual Fair on the grounds of the society, on the 4th, 5th, 6th and 7th days of October, 1864.

There is a manifest improvement in the horse and sheep stock.

The principal crops raised in the county are wheat, corn, hay, barley and oats. Owing to the drouth, the crops of corn and hay are below the average. Oats was a good crop. Wheat was much winter-killed by the extreme cold of January 1st.

Number of members, 1195; premiums, 289; and paid for premiums, $628.

CLERMONT COUNTY.

The Sixteenth Annual Exhibition of the Clermont County Agricultural Society was held upon their *new grounds*, located near the village of Boston, on the 6th, 7th, 8th and 9th days of September, 1864. This Fair, in its arrangements and results, was certainly the most successful ever held in the county. It is not claimed to have been the "largest exhibition" ever held in the county, or that the attendance was the largest, but that, while respectable in the quality and variety of the "show" and in the number of visitors, the great and striking feature of the occasion was the universal pleasure enjoyed by all in attendance. My duties placed me in a position where I could see every individual as they retired from the grounds, on the last day of the Fair. Every countenance was radiant with smiles, every voice loud in exclamations of praise, and every heart beating pulsations of joy; and as the thousands of old men and matrons, young men and maidens, boys and girls, passed out through the broad gateway, after the close of the fourth day's exhibition, exchanging congratulations, inviting each other to the "next year's Fair," and resolving to be there, I felt that the "Board" had, in unmistakable language, the plaudit "Well done, good and faithful servants."

A few words of explanation in regard to our "new grounds." You are aware the exhibitions of the Society were held for several years near Bantam; but, after five or six years' trial, the grounds were found totally inadequate to the necessities of an exhibition. Scarcity of *water* and *shade* were among the difficulties for a pleasant entertainment, so, about eight years since, the Board looked about for new and more appropriate grounds, and for eight years the exhibitions were held at Olive Branch, where the Society had ample shade and an abundance of water; but the lease being about to expire, and an absolute necessity for owning the exhibition ground having impressed itself upon the minds of our prominent farmers, and by them infused in the board of management for 1864, an unsuccessful effort was made to purchase the Olive Branch grounds. A committee was appointed, propositions for the location invited, and every place examined that was thought to be adapted to our wants. Early in the spring our present site was purchased; a piece of wood land, twenty-three acres in extent, without fencing, and *nothing* to recommend it but surface, shade, location and price, and nothing to do to it but *improve* it. Our country is at war; most of our young men are now in the army; the Governor has called for the militia for a hundred days, and suggestions are made by the timid that "we can't have a fair *this year* on the new ground." The question must be decided by the Board. A resolution was adopted, that we would hold our Fair on the new grounds, on the 6th, 7th, 8th and 9th days of September. An estimate showed we had some one hundred thousand feet of lumber on the old ground to be taken to the new. An invitation was given, and scores of teams turned out to donate a day's hauling to the enterprise, and a big job was done. On the first day of August the Board met on the ground, for a "protracted meeting." Contracts were let for grubbing the horse track, digging wells, erecting a fence, building amphitheatre, halls, &c., &c. Trees were trimmed up, logs rolled and burned; in a word, the grounds were in complete order *in time* for the exhibition. Critics say we now have the prettiest fair ground in the State. We certainly have an abundance of shade, an inexhaustible supply of water; wells located in positions where the water is needed; no long walks to the spring; no sweltering in the burning sun, and no suffering for water. Our "track" is one half mile, "to an inch," smooth, and an easy grade; our stabling very complete, in all departments; our agricultural, mechanical and floral halls very commodious, and well adapted to their several uses.

An old debt rested upon the Society, for improvement of the grounds at Olive Branch, which was bearing heavily, and bidding fair to crush out the energies of the Society. A scheme was originated and placed in operation by the present Board which works like a charm, and promises, before the close of another year, to put the Society out of debt and pay for all the new improvements. It was the formation of a stock company inside of the county society, and regulated completely by it. It was proposed to issue certificates of stock, or membership, to two hundred persons, each of whom should pay to the treasurer twenty dollars, making an aggregate fund of four thousand dollars ($4000), redeemable at the pleasure of the Society after five years, or not at all, at their discretion. This is, in effect, making two hundred persons life-members for the consideration above named, and organizing a permanent society, each of whom is interested, in all the future, in making the annual exhibitions of the Society successful.

The first day, or day of preparation, was showery; the second, or Wednesday, no more favorable than the first, yet there was an attendance that showed the Fair was not forgotten. Still, there was great interest felt for the third day, and the sequel showed great preparations made for it, notwithstanding the early morning was forbidding, clouds still lowering; yet by 8 o'clock A. M. the rush commenced, and by 12 o'clock M. our grounds were beautifully crowded, and every department well supported.

When we take into consideration the distracted condition of our country, the scarcity of labor in our department of industry, and the work necessary in preparing a new fair ground from the stump, and recognizing the existence of a powerful, independent agricultural society within the limits of our county, in complete and successful operation, we cannot but feel proud of Clermont county and her noble sons and daughters, and predict for her a glorious future.

The products of our county, as heretofore, are corn, wheat, oats, rye, barley, hay, buckwheat, beans, potatoes (Irish and sweet), apples, peaches, pears, grapes, raspberries, strawberries, &c., &c.

The corn crop is below an average one—shortened by the drouth on the uplands, and damaged by the great storm on the lowlands. Oats were an important crop this year; a large number of acres were devoted to this crop, and the yield a good one. Wheat, rye and barley were each a short crop. Hay crop was fair. Buckwheat and beans scarce. Potatoes were variable; some of the early plant in the East Fork Valley yielded well and paid largely, and some of the late plant made a fair crop, while almost the entire middle plant (or April and May planting) was a failure. An apple orchard here and there presented full crops of fine fruit, while the majority proved failures. Peaches, of which we have the largest orchards in the State, or the West, were an entire failure, in consequence of severe frost of last winter, especially of January 1st, 1864. Pears were also scarce, except upon dwarf trees in sheltered positions. Grape vines having suffered in common with all fruit-bearing wood, gave but a short crop—some varieties, however, proving more hardy and more productive than others; Concord, Ives' Seedling Norton's Virginia, Clinton and Delaware, all doing better than the old favorite Catawba. Raspberries were better than for some years past. Strawberries, the cultivation of which our people are just beginning to appreciate, are attracting considerable attention. Experiments in this county show that *one hundred and seventy bushels per acre* can be produced, and the fruit greatly superior to that from uncultivated fields.

In concluding this report, we wish we could give a more flattering notice of the taste for reading by our farmers. With an occasional exception here and there, you will look in vain for an agricultural paper upon their tables. Many take a "daily," and a religious paper; some a literary monthly, and a few, our county papers; while, perhaps, one in a hundred take the Ohio Farmer, Gardeners' Monthly, Horticulturist, or Country Gentleman—two, at least, of which should be found in the family of every intelligent farmer in our State.

CLINTON COUNTY.

Our Fifteenth Annual Fair was held at our Fair Grounds, near Wilmington, on the 21st, 22d and 23d days of September, 1864, and was better attended than any fair held in this county since the commencement of the existing war. Our fair was held under as favorable auspices as could be expected, considering the unfortunate condition of our country. A battalion of the O. N. G.'s had just returned to our county, fresh from Berryville and Monocacy, and of course their presence insured a good attendance. In a pecuniary point of view we met with as perfect success as the most hopeful could desire. Our exhibition of cattle was not very good however. The show of horses was unusually large, and some very superior ones on exhibition. Our other departments were very full, and in the floral department we had a splendid exhibition.

CORN.—The yield was large and of good quality. The crops will average 50 bushels per acre.

WHEAT.—A tolerably good crop, averaging 17 bushels per acre.

OATS.—A tolerable yield, averaging 21 bushels per acre.

HAY.—A fair crop, at an average of 2 tons to the acre.

BARLEY.—Not much cultivated; average per acre, 23 bushels.

RYE.—Not generally grown; yield light; average, 13 bushels per acre.

BUCKWHEAT.—Little produced; an average of 9 bushels per acre.

POTATOES.—A good crop; an average of 77 bushels to the acre.

BUTTER.—358,351 lbs., of a good quality.

CHEESE.—37,391 lbs., of good quality, and mostly consumed in the county.

The crops, of which an estimate is hereinbefore given, are the principal crops of our county. They were not damaged by insects of any kind, but the wheat was greatly injured by smut.

We had 723 members and 477 entries.

In view of the above circumstances, and the fact of so fair an exhibition and attendance in times like these, we think we may fairly infer an increasing interest in the annual exhibition of the society.

COLUMBIANA COUNTY.

Our Society during the past year has been more successful with its annual fair than its most sanguine friends anticipated, and we feel satisfied that upon the return of peace to our now distracted land, its usefulness will be much more apparent than heretofore. Although our country's call has drawn so many of our noble yeomen from the county, yet the second day of our fair witnessed more people on the fair grounds than ever before.

The show of articles and animals (except sheep) was not as large as it has been heretofore.

The number of members this year was 301.

The fair was held on the 23d, 24th, and 25th of September. The weather was very good, and all passed off very pleasantly.

We commenced the year with a debt of $341, and have been able not only to pay off all our premiums and other expenses of the fair, but also to discharge our indebtedness.

The apple crop in this county the present year was very large.

WHEAT.—The crop in this county was very light, not more than half an average crop, which is about 15 bushels per acre.

CORN.—This is a very important crop with us, and this year has proved very successful, being rather better than an average crop.

OATS are extensively raised, but owing to the drouth this season, the straw was very short, and not an average crop of grain.

POTATOES.—The crop of potatoes this year is the largest grown for many years, but in many instances they are rotting badly. The most popular variety grown here is the Jersey Peach Blow.

Owing to the wet and growing weather during early fall, pastures were very luxuriant, and stock went into winter quarters in excellent condition.

The striking characteristics of the past season were extreme drought during the months of June, July, and forepart of August, followed by excessive wet.

We had no entries of field crops the past year.

COSHOCTON COUNTY.

The Society held no fair for the year 1864, but has maintained its organization. Its situation is, therefore, precisely the same, financially, as at the last annual report.

The condition of agriculture within the county has not differed materially from other years. The drouth of the two past seasons, and the fact that most of the fine stock in the county had been exhibited at former fairs, with the fact that an exciting Presidential canvass agitated our part of the State more, perhaps, than some others, were the reasons that chiefly determined the Society to dispense with the fair for one year. We also thought new interest would be awakened in the coming year, if it should prove a favorable one for agricultural and horticultural productions.

CUYAHOGA COUNTY.

The Cuyahoga County Agricultural Society was duly organized by election of officers in January, 1864, a premium list arranged and published, a public exhibition held in September, and awards made. A very *wet* rain spoiled the attendance at the fair.

DELAWARE COUNTY.

The Society, at its last fair, labored under the disadvantage of wet weather and cold, which kept away a large number of our citizens; but, notwithstanding the inclement weather, the attendance was large, and the whole fair characterized by the utmost order and good feeling. Our membership for the past year numbers six hundred and twenty-nine. The prospects of its progress and usefulness are most encouraging. It has become an "institution" in our county as necessary and fixed as our court.

The principal crops raised in the county are wheat, corn, flax, oats and potatoes. The yield was not as large as usual, in consequence of want of attention, owing to the absence of nearly a full regiment of men (mostly farmers) in the 100 days' service. We cannot form an estimate of the amount of each crop raised, or the average yield per acre. We can say, however, that the average yield of potatoes and corn was as large, if not larger, than any previous year. That of wheat and oats not so large.

FAIRFIELD COUNTY.

The Thirteenth Annual Fair of the Fairfield County Agricultural Society was held at their fair grounds on the 12th, 13th and 14th days of October, 1864. The interest manifested has not been as general as formerly, and the exhibition of stock, etc., was not what it might have been. But few counties in the State can boast of better stock than Fairfield, particularly in cattle, horses and sheep, but competition in live stock did not meet with that response from our best farmers and stock men we could desire. But, notwithstanding these drawbacks, the attendance was quite large, and our fair far from a failure, as was feared.

In the cattle and horse department the show was not as large as formerly.

The show of vegetables was good, both in quantity and quality.

Our fruit crop, except apples, has been very small. Some very fine apples were exhibited, and some beautiful specimens of grapes, the culture of which is receiving considerable attention, the soil in parts of our county being peculiarly adapted to grapes.

Household fabrics, needle and fancy work, were well represented.

The principal crops raised are wheat, corn, barley, hay, oats and potatoes. I have no data from which to give the average yield, but generally our crops are better than last year.

FAYETTE COUNTY.

This year the old emulation seemed to be revived among the members, and all seem determined to make the society still, what it ever has been, the best in the State. To the ladies of our county belongs the praise of outdoing anything ever before witnessed in this county. Their Floral and Domestic Halls formed the most attractive feature of the fair. The stock of horses this year was more than an average in kind and quality. Sheep about an average, while the cattle were not equal to former years in number or quality. Some of the animals, however, were of the finest kind. Swine, fowl and farming implements about an average.

FRANKLIN COUNTY.

The Board of Managers of the Franklin County Agricultural Society beg leave to present their annual report:

The Society is not in a very flattering condition financially, owing in a great measure to the falling off of the receipts at the late fair, occasioned by the inclemency of the weather and the apathy of many of its members. Of late years our society has had to depend almost entirely upon country members for its support, the citizens of the city having, one would think, entirely forgotten the existence of such an institution.

The meetings of the society the past year have been few, and nothing transpired at them of interest to the public.

The Annual Fair was held on the 4th, 5th, 6th and 7th of October, 1864, several weeks later than usual, and, although the exhibition in every respect was fully equal to any heretofore held, the inclement season prevented such a turn-out of our citizens as was expected.

The wet and cold weather of the winter of 1863 and 1864 damaged the wheat crop of our county materially. Most of the grain crops were winter-killed. The fruit crop the past season was, so far as apples were concerned, a good one. Other fruits were a failure.

GEAUGA COUNTY.

The annual fair of 1864 of the Geauga county Agricultural Society was held on Tuesday, Wednesday and Thursday, the 20th, 21st, and 22d of September. They were three as pleasant days as there were during the fall, and the fair passed off quietly and in good order.

As the time approached fears were entertained that it might be a failure owing to the interest felt by the people in the state of national affairs, and the excitement over the draft, which was being enforced at or about that time; and also the fact that many of the members of the society were absent during the best of the season, leaving their farms for the sake of aiding the Government in the present crisis, as "hundred days' men." But the result proved it to be a decided success.

The exhibition this year was superior, and the number of entries larger than any year since 1860. The exhibition of cattle, though not large, was superior in quality. That of horses, as usual, was large and full in all classes. The show of mules, sheep, swine, and poultry was unusually good.

The exhibition in the Hall was better than it has been for several years past. The show of fruit, vegetables, garden and field seeds, being excellent. There was also a very fine exhibition of cheese of both dairy and factory make. Of the latter there were single specimens of cheese on exhibition weighing nearly one thousand pounds. As might be expected, they excited much interest in this method of manufacturing cheese. There have been sixteen of these factories in successful operation in the county during the past season, and several more are being erected this winter. There is little doubt now in this section that the cheese will all be manufactured in this manner in a few years.

The society now numbers about 240 members. It for several years past has been laboring under a debt incurred by the erection of new buildings and the enlargement of the grounds, but the successes of the annual fairs have enabled the society to gradually liquidate this, until now there is only a small amount in comparison left to be paid, and another year will find the society free and above board.

Crops in this county, with the exception of wheat and grass, were generally good this season. The failure of the wheat crop was attributed to the extreme cold weather and cutting winds, with but little snow to protect the ground, which occurred about the first of January. On many fields the seed was barely saved, and on others not even as much as that. The failure of the hay crop was owing principally to the dry weather of June and July. There was hardly one-fourth of a crop cut from upland meadows. Low meadows were somewhat better. The dry weather also affected the corn during the first of the season, but after the rains came on in August it came forward very fast, and bid fair to be a very heavy crop, but owing to the very wet weather later, did not ripen so well as usual, still was more than an average crop. Oats, rye, buckwheat and barley were about an average crop each.

GREENE COUNTY.

The Greene county Agricultural Society held its annual fair on the society's grounds at Xenia, September 7th, 8th, and 9th, 1864, and although not so successful as it *should* have been, yet it was in advance of former years. The receipts were sufficient to pay all expenses and leave a handsome balance in the treasury.

The exhibition in all departments was much the same as former years. The general interests of agriculture and mechanism are in a flourishing condition, which is the natural result of the fostering care of our county society.

Crops of corn, wheat, oats, barley, sorgho, potatoes, and turnips, good, and have made a handsome return for the labor of the husbandman. Tobacco and flax, short. Wool growing, in common with other localities in our State, is receiving its full share of attention. The high prices now offered for cattle and swine have suddenly opened the eyes of the public to the fact that sufficient attention has not been bestowed upon these classes of stock, particularly the former, and as a natural consequence, we are unable to supply the increased demand.

Horses, good, but have made no *marked* improvement. The handsome prices realized for farm products during the past year has caused quite an advance in our farming lands, and stimulated thus to increased energy, our farmers are laboring with commendable zeal to make the best of *their present harvest time.* While we much regret the "life-struggle" through which our nation is passing, yet we are forced to the admission that in an agricultural and mechanical view, we are to-day many years in advance of our position at the commencement of the war, having by *compulsion* developed our industrial resources to an extent beyond the expectations of the most sanguine.

GUERNSEY COUNTY.

The sixteenth annual fair of the Guernsey county Agricultural Society was held on the society's grounds adjoining Cambridge, Ohio, on the 5th and 6th days of October, 1864.

There was perhaps the best show of stock that we have ever had in our county, and a lively interest taken in that department.

The second day being exceedingly stormy, the show of vegetables, and the products of mechanical skill were not so good as heretofore.

The prospects of the society for the accomplishment of good is better than heretofore.

The principal crops raised in our county are wheat, corn, oats, rye, buckwheat, barley, potatoes, hay and sorgho, yet a lively interest is being taken in the cultivation of fruits, and especially in the grape, which promises well with us.

HANCOCK COUNTY.

Our last Annual Fair was held Oct. 6th, 7th and 8th, and was almost a failure. The causes leading to such a result were simply these: A hard winter, dry summer, heavy draft, and very disagreeable weather during the Fair. The number of members for the present year is 137.

The display of articles during the Fair was meagre; that of sheep only being respectable. The number of premiums awarded was not so large as that of former years.

HARDIN COUNTY.

The officers of the Society decided not to hold a Fair in 1864, though subsequent events indicated that if if they had, it would have proved a success. They simply met upon the Fair Grounds, and elected the usual officers for the ensuing year.

The condition of agriculture in the county for the past year has been rather flattering. Wheat averaged about fifteen bushels per acre—not as much as in former years, in consequence of its being winter-killed in the latter part of winter; but there being more than the usual number of acres sown, it made a heavy crop. The county is well adapted to this crop; and if our farmers would cultivate less, and that in a better manner, it would prove a highly remunerative crop—a course that ought to be more generally pursued with all grain crops. The corn was a full average, say thirty bushels per acre. Grass was rather light, owing to the drouth in the latter part of May and June. The average would not exceed three-fourths of a ton per acre. A very light potato crop.

There was an unusually heavy crop of apples. The county promises to be one of the first in the State for this product. Being a new one, the inhabitants have availed themselves of the most improved varieties.

The horses, cattle, sheep and hogs are being somewhat improved, though less attention is paid to the improvement of cattle and sheep than their importance demands. The thrifty farmer appreciates the fact that it is more profitable to raise cattle that will average 1400 or 1500 at three years old, than those that will scarcely weigh that amount at the age of five; and a quality that will bring from $2.00 to $2.50 more per hundred in market. He also realizes that it is no more expense to raise sheep that will average five pounds per fleece, than those that will average but three.

We are confident that the Agricultural Institute or College, which is about to be erected by the State, and endowed by the munificent donation of Congress, will tend to dignify labor, make the masses look upon farming as a more honorable vocation—in a word, do for the agriculturist what science has done for the other pursuits and callings in life. We have no doubt that the Institution will be filled with the most promising young men of our State, for the future to them would be full of hope. We would rather have a son of ours graduate in this institution than in any college in the land, if rightly conducted. We will insure a liberal support from this county.

The wicked rebellion of the disloyal States has materially checked the emigration into, and consequent improvement and cultivation of, our county; but we look forward with a well-grounded belief and hope, that the time is not distant when peace will be restored to our borders, and greater advance made in the arts and sciences than at any former period.

HARRISON COUNTY.

The Harrison County Agricultural Society held its Seventeenth Annual Exhibition on the 5th, 6th and 7th days of October, A.D. 1864. It was suggested by some of our good citizens that we postpone the Fair for one season at least, inasmuch as the war was upon us; a great many of our noble and enterprising young men were in the army; that if we had any money to spend, the families of the soldiers needed it all; and besides all that, if we made an effort to hold a Fair, we would break down and would never be able to rise again. Our Fair opened with a good prospect, the weather on the first day fine; but on the morning of the second day, it looked very gloomy—the rain was falling in torrents; the indications were, then, that our Fair, for the first time would be a failure. But soon in the day the clouds passed away, the sun shone out, and the people began to flock in again from every quarter; and now, instead of our Fair being a failure, it was a grand success. The number of entries was about as usual, amounting to about two thousand. The number of members belonging to our Society is nearly one thousand. The amount of money collected was $1,730. Our Fair, taking it altogether, was a grand success. We now see nothing to hinder us from having a good Fair every year. At this, as at all other former Fairs, we had a fine display of horses of different grades and qualities, thus making the horse ring the centre of attraction to a great many of the spectators. The show of cattle and hogs were rather meagre. We had the finest display of sheep we ever had since the organization of our Society. Some were there, brought from Vermont, valued at $5,000 per head. The wool crop of "Old Harrison," the past year, brought in about $450,000. The floral department was very well represented. The ladies of our town and county deserve great credit for the interest they took in preparing their nice embroidery, quilts, coverlets, butters, jellies, jams, pickles, &c., all of which went to contribute beauty and excellence to the Floral Hall.

The mechanical department was not so well represented as it had been on some former occasions, though respectable. Everything passed off quietly and in order, no accident having occurred during the Fair.

The principal productions of our county are wheat, corn, oats, hay, potatoes and sorghum.

WHEAT.—Our crop of wheat, harvested in 1864, was light, having been frozen out about the first of January. Cannot give the average number of bushels per acre. Price per bushel, two dollars.

CORN.—Our crop of corn this year was reasonably good—say about 45 bushels per acre. Price per bushel, ninety cents.

OATS.—We had a full average crop of oats the past year. Price per bushel, seventy-five cents.

HAY.—Was a tolerably good crop the past year—say two tons per acre. Price per ton, twenty dollars.

POTATOES.—In consequence of the dry weather in the first part of the season, our potato crop was a partial failure.

SORGHUM.—Is only being raised in small quantities by the farmers, a great many desiring to make the experiment for themselves, as to whether the culture of sorghum is profitable. Thus far it has been thought by the farmers to be a success. As much as 40 gallons have been raised from one-fourth of an acre. Worth with us, one dollar per gallon.

HIGHLAND COUNTY.

The annual fair of the Highland Agricultural Society, was held at the fair grounds on October 5th, 6th and 7th. The show of stock was not large in either of the stock departments. Floral hall was well represented, also, domestic manufacturing.

HURON COUNTY.

The tenth annual fair of the Huron County Agricultural Society, was held at Norwalk on the 28th, 29th and 30th days of September, 1864. There were several entries made for premiums on field crops, but the competitors have failed to furnish the statements required, as to the manner and expense of cultivation. The number of members of the society is two hundred and twenty-five.

The receipts of the society from all sources for the past year as per Treasurer's report, are eighteen hundred and eighteen dollars and six cents.

The premiums awarded amount to six hundred and twenty dollars. The expenses and improvements on the grounds were nearly five hundred dollars. The balance of the receipts has been applied on the indebtedness of the society, which was contracted last year in fitting up the new grounds. The remaining debt of the society is one thousand dollars. This indebtedness is in notes for money advanced to the society by its members in sums of ten dollars each, for the purpose of fitting up the new fair grounds. These small notes are held by members of the society, who are interested in its future progress and success.

Our society is firmly established, and well sustained by the people of the county. Its utility is beyond question. The exhibition of stock and fabrics at the last fair was not so large as that of last year, on account of the rainy and inclement weather at the time of the fair. The exhibition of sheep was superior in numbers and quality to any previous year. Farmers are giving greater attention to the improvement and increase of their flocks of sheep than to all other kinds of stock, but little care and expense are bestowed by the farmers to the raising and improving of good cattle and hogs, or horses, in this county. A large number of *dark colored* sheep have been brought into this county during the past season and sold by peddlers from the States of Vermont and New York, at high prices to inexperienced breeders of fine wooled-sheep as *pure American merinos*. The fall rains have worked off from those *foreign sheep* the only marks giving them the name of *merino*.

There are no statistics giving the number of bushels of grain raised in the county the last year. The average yield of wheat is about one-half of the usual crop—I think not more than seven bushels per acre—the wheat was injured by freezing during the winter and spring months. The wheat obtained is poor in quality. Corn, thirty bushels per acre; oats, forty bushels; barley, twenty; hay, one and a half tons per acre, secured in fine condition; potatoes were badly affected by the rot when harvested, no more than one-third of a crop was realized—thirty bushels per acre. The fruit crop was a failure except apples, which are abundant and of excellent quality.

Sorghum was a good crop the past season. Two hundred gallons of syrup were obtained per acre. The farmers are giving increased attention to its cultivation. Great improvement has been made in the manufacturing of the cane into syrup. The syrup is worth by the barrel, in market, one dollar per gallon. The past season has been characterized by extremes of wet and dry weather. The spring was wet and cold, followed by a damaging drouth in June and July. The fall was very wet and unfavorable for securing crops.

Many farmers sustained a great loss in their fall crops on account of the wet weather and scarcity of labor. There has been no damage done to grain or fruit by the insect tribes the past season.

No improvements worthy of mention have been made by farmers in draining their farms or in cultivation for the past year, on account of the absence of their sons in the service of their country. Farmers have all they can do to hold their own. While so many men are required to put down the rebellion, it is difficult to obtain labor sufficient for the *seed time* and *harvest*.

JACKSON COUNTY.

Our society held its tenth annual fair at Jackson, October 6th, and 7th. The attendance was all that could be expected. The show of articles on exhibition not so large as usual, but of good quality.

The show of horses was good, but more numerous in the classes of brood mares and fillies. The large stout horses have been bought up for the use of the army. Besides this, the notorious John Morgan, made a conscription in July, 1863, of several hundred of the best in the county.

With the present stock of brood mares on hand the supply will be kept up. The exhibition of improved cattle was good. The "scalawag" or native breed is about bleeched out.

In hogs we have nothing to feel proud of: rather on the back ground; cause, almost a failure of the corn crop for the last three years. Can't help it.

Sheep an excellent show, both in numbers and quality. Sheep husbandry in this county is bound to win. It is believed in a few years the wool produced will equal in value that of corn.

The hall on the last day of the fair was the center of attraction. It was here the handy work of the farmer's wife and daughters was exhibited. The production of articles of usefulness and ornamental was numerous, and argues well for the industry and intelligence of our mothers, wives, sisters and daughters.

Samples of the grain crop, root crop and vegetables were respectable; yet the unpreceded dry summer told fearfully on their numbers and quality.

While the fair was one of unusual interest, and will have a good influence on the agricultural interests of the county and, perhaps, at no other fair were there so much good feeling and social intercourse manifested among the people; yet there is an aking void this world can't fill.

Our mothers, sisters and daughters are, too many of them, dressed in mourning. They have lost friends, the society have lost friends, why is this wicked rebellion in progress in our once happy land? Stern duty has called nearly two thousand of our brave boys to the defence of our country, and many of them have fallen in her defence—peace be with them.

The society numbers 177 members.

The principal crops raised in the county are corn, wheat, hay, oats and potatoes. Corn, a very light crop, perhaps, will average 15 bushels per acre. Wheat almost a failure; the smallest crop ever produced in the county, will not average more than 5 bushels per acre. Hay, not quite an average crop; but the quality, good, will average one ton per acre. Oats, a short crop; not a reliable crop, average per acre 15 bushels. Potatoes, a moderate crop; yield per acre 125 bushels. Fruit—apples a fair crop, good quality; peaches, none; pears a few, not many trees in bearing; grapes, a good crop.

The striking characteristic of the past season was an unusual drouth that prevailed in the forepart of the summer. Very little rain fell in the months of May, June and July, which caused the failure in the corn, oats and hay crops. The wheat was killed by the severe frost in January. The months of August, September and October were quite favorable, and brought on a fine fall pasture.

Destructive insects were not numerous; the midge injured the wheat in some localities, the grub-worm and grass-hopper did some little damage in their line of business.

LICKING COUNTY.

The crops in our county are the same as raised in all parts of the State. Weevil was very bad on some fields of wheat; generally on fields which were low and wet; smut was also very bad, completely destroying whole fields of wheat. There are some insects which I have never had an opportunity of learning their names, that were troublesome this year. Caterpillars were very numerous this season.

LOGAN COUNTY.

The three principal days of the fair were wet and stormy, and nothing short of a determination on the part of the citizens to keep up the fair, made them brave the rain and storm for three days and made it at all passable as a county fair. In many of the departments there was great deficiency, in some the exhibition was good.

The quality and quantity of sheep were fine, comparing well with the State fair.

Wheat crop an average yield; corn in loam grounds good, in clay grounds much below the average, caused by the long continued drouth in the spring; oats, (not much raised) three-fourths average; grass, average; flax-seed, three-fourths average; clover-seed, average; clover-hay exceedingly good.

There is a large amount of wheat grown; the average yield per acre would not exceed 20 bushels, while in some instances more than 40 bushels. Corn an average, not to exceed 25 bushels per acre.

LORAIN COUNTY.

In making this, the eighteenth annual report of the Lorain county fair for the year 1864, of the Lorain County Agricultural Society, I have to state that, all things considered, our society may be said to be in a prosperous condition.

The annual fair of Lorain Society for the year 1864 was held at their fair grounds in Elyria, on the 5th, 6th and 7th, days of October, and had we made it a point to have selected rainy, uncomfortable days over head and under foot, we could not have hit upon a more inauspicious time. But notwithstanding the rain and mud, the exhibiters and the people turned out and we had a good show in almost every department. The show of horses was good; of cattle, fine; of sheep, first rate; of hogs, fair; of poultry, middling; in mechanic arts, dairy products, fine arts, domestic manufacture, from fair to middling. The show of fruit was capital, particularly in grapes, showing conclusively that this Lake Shore region is the location for grapes. The people were out in goodly numbers not heeding the mud or rain, and manifested generally a good spirit—a spirit of determination to have their annual fairs kept up and sustained. I am of the opinion if our county fairs can be sustained as they have been for the last three years in the midst of a cruel desolating war, and it being our lot to have constant storms on nearly all the days of our annual fairs for the last three years, that we can live through anything.

Number of contributing members for the year 1864, 396.

Number of entries made for exhibition, 972.

The general condition of agriculture in Lorain county is very good, and constantly improving. The wheat crop was a failure for the year 1864, owing to the killing frost on January 1st of the same year. Corn was a fine crop; oats an excellent crop; hay good in the north point of the county; potatoe crop fair. Owing to the wet fall, a good many persons could not dig their potatoes and many were left out to rot and freeze. The fruit crop was most abundant.

The production of butter and cheese was heavy, with fair renumerating prices.

There is a good deal of attention being paid to underdraining with encouraging results. What Lorain county needs to make it one of the most productive agricultural counties in the State is thorough underdraining, deep plowing, in short, good, skillful, systematic, practical and scientific husbandry.

LUCAS COUNTY.

Considered as a mere question of profit the fair was not a success, but as an exhibit of the farm stock and agricultural capacity of the county, it was. The entries of live stock and produce amounted to over three hundred on the first day, notwithstanding the fact that the weather was raw, cold and disagreeable. The indications led the efficers to anticipate the best exhibition ever held in the county, but in the evening of the first day it began raining, and on the morning of the second day snow began falling, and it continued to snow and rain during the entire day. A more disagreeable day is seldom witnessed.

As soon as it became apparent that the attendance would be small, and the receipts light, the magnanimity of a few of the largest exhibiters led them to a proposition, which resulted in the call of an impromptu meeting, and on motion of Thomas Thornloe, seconded by R. C. Thompson, the following preamble and resolution were adopted:

WHEREAS, The weather is so very unfavorable and it is evident the society will not have receipts sufficient to pay premiums, therefore,

Resolved, That we will voluntarily renounce all claims for premiums that might have been awarded, but recommend the examination and report of what is exhibited.

The above was passed with but one dissenting voice, when the committee was organized, attended to their duties and submitted their report.

MADISON COUNTY.

Our Fair was well attended by visitors, with the finest show of horses and sheep ever made in the county, while it was very meagre in the other departments.

There were no entries for premiums on field crops.

The principal crops raised in the county are corn, wheat, barley and hay. The average amount raised of each is a full average crop compared with past years.

The early part of the season was dry, but the fall rains helped out very much.

MAHONING COUNTY.

The Society consists of 411 members. The annual fair was held on the 4th, 5th and 6th days of October. The attendance on the second day was extremely good—a larger attendance than ever before. The attendance on the third day was small, owing to the inclemency of the weather. The different classes were well represented and liberal premiums offered. The articles entered were generally of a superior quality, and the fair gave very general satisfaction. The track, in consequence of constant rains, was soft, and in a poor condition for the display of horses.

The whole number of entries was 941.

The Society has heretofore been involved in debt to a considerable amount, and has diminished it the past year over $400, and will be enabled by another year, with proper management, to discharge the entire debt, which will enable the Society to offer better premiums and add a new interest to the fair.

AGRICULTURAL PRODUCTIONS.—The wheat crop was almost totally destroyed, by being frozen out in the winter. The early summer crops were injured very much by the dry weather, and perhaps not more than half a crop was obtained. The fall crop was a full one; though of the potatoes, of which there was an extraordinary yield, at least half have been lost from rot.

FRUIT.—The fruit crop was generally good, except peaches and plums, which were a failure.

DAIRYING.—Considerable attention is paid to dairying. Cheese is made to some extent. Butter is made largely for marketing.

We have no means at our command for making an accurate statement of the amount of products produced in the county. The returns of the assessors are generally taken without much regard to accuracy, and form but a very poor data from which to obtain such statistics.

STOCK.—There is considerable improvement in stock of all kinds, and especially in sheep. The farmers, within the last few years, have bought largely, and improved their flocks from sheep brought from Vermont, and stock is much better taken care of and provided for now than formerly, and we think that the stock of this county will compare favorably with that of the other counties of the State.

MACHINES.—The farmers of the county have introduced most of the improvements in the line of machines, &c., that are useful, necessary and labor-saving.

MEDINA COUNTY.

The Society owns, by deed, sixteen acres of land favorably located a half mile west from the court-house, a portion of which is well shaded with native forest trees, and supplied at all seasons with water.

The track for trotting and testing speed measures one-third of a mile in circumference, and is favorably located.

A large fair-house, eating-house, oyster saloon and grocery are erected on the ground, and owned and managed by the directors of the Society.

The progress made by the Society for the last two years in the purchase of ground, and the erection of buildings and the furnishing of materials give evidence that the farmers, mechanics, manufacturers and merchants of Medina county intend to sustain yearly Fairs, where specimens of the various productive trades will be exhibited.

The Nineteenth Annual Fair was held on the 3d, 4th and 5th days of October, 1864. Every article exhibited was meritorious, and the owners manifested a commendable zeal in their attempts to compete for premiums. Competitors for premiums on crops were few, owing to a very dry season commencing early and continuing until late in June. The different kinds of grain and seed exhibited were of choice kinds; yet the average yields per acre were few, in report. Some townships had excellent crops of oats, corn and hay; others, being devoted to grazing, cannot be reported as average in yield of any kind, except hay.

POTATOES were more than average yield; but when gathered, signs of disease appeared, and, at the date of this report (Dec. 15), many farmers have lost fully the half of the crop gathered, by rot.

CORN was average yield and good in quality.

OATS yielded well, although many had supposed that the dry season had nearly checked the growth of the crop.

WHEAT was a failure, and many farmers who had raised wheat to sell, are compelled to purchase all the flour used in their families.

RYE is not sown generally, and cannot be reported as one of the kinds of grain raised or used in the county.

GRASS was a full average yield.

FLAX was sown in greater quantities than formerly, for the seed and lint, and promises a profitable yield to the farmer.

CLOVER is yearly becoming a favorite crop.

FRUIT.—Apples were a full yield; grapes a moderate yield; no peaches; few cherries.

Garden vegetables, although seemingly dead in May, recovered under summer rains, and yielded an unexpected growth, excellent in quality.

STOCK.—A very great improvement is yearly to be seen in selection of horses intended for speed; not so much for draft.

CATTLE.—Every year shows a marked difference in the choice of cattle, more particularly in the selection of cows for butter and cheese.

SHEEP.—The farmers of Medina county have spared neither time nor money in order to introduce and keep on hand large flocks of sheep noted for wool.

OUR PROSPECT.—We do not claim the title of wealth, but we deserve the appellation of perseverance, and, in point of Fairs, claim equality with any county on the Western Reserve.

MIAMI COUNTY.

The Eighteenth Annual Fair of this Society was held on the 5th, 6th, 7th and 8th days of October. Owing to heavy rain on two days of the

Fair, the attendance was not so good as it would have been had the weather been fine.

The amount of premiums offered this year was $1000, five hundred dollars of which were awarded at the Fair. Number of entries 685; there were no entries for farm or garden, and but one for field crops. The exhibition of horses of all classes was the best ever had in the county. The exhibition of sheep, both fine and long wool, showed a marked improvement over other years. The show of grains was very good. The vegetable department was not so good as usual, owing to the drouth in July and August. The mechanical, floral, and fine art departments were not well represented, on account of the rain.

The number of memberships sold was 512; day tickets, 920.

The wheat, barley and oats crops of this year were good; corn, and all other summer crops, suffered somewhat from drouth in July and August.

Agriculture and stock raising has never been in a more flourishing condition in our county than at this time, and we look forward to many years of uninterrupted prosperity.

MORGAN COUNTY.

The Society held its Twelfth Annual Fair, at their grounds near McConnelsville, on the 18th, 19th and 20th of October, 1864; and, notwithstanding the lateness of the season, the weather was very pleasant and the Fair was well attended.

There was no competition for premiums on field crops.

The number of members for 1864 is 302.

The prospect for usefulness and progress of the Society continues good.

The exhibition of stock at the Fair was very good, better than heretofore; exhibit of sheep very superior.

The principal crops raised in the county are wheat, rye, corn, oats, buckwheat, barley, sorghum, flax, potatoes and tobacco.

MUSKINGUM COUNTY.

The good cause of agriculture is still improving amongst us, although its progress is not so rapid, nor so thorongh as its friends desire. The observer will perceive that more care is taken in the preparation and tillage of the soil, in the selection and planting of seeds, in the care attendant upon their growth and maturity, in the adaptation of seed to soil, and in short, a development of a more intelligent supervision in all and over all that pertains to the business. The days of sneering at "book farming," and prejudices against it, are fast passing away, and even many of those whose ideas of farming were formed years ago, and who have been treading the well beaten track trod by their fathers, begin at last to see that to farm well, intelligence and that of a high character must be brought to act upon the farm and all its operations in detail, and that a man is not to be looked upon as a visionary theorist who studies well the soil and its adaptations, who is in short a "book farmer;" and it is to be hoped that the intelligence contained in our agricultural journals and books will more generally be diffused, and that any man who pretends to farm at all, will be able to do so with a full understanding of the means to be used and the ends to be accomplished in the business.

The increased attention to sheep husbandry spoken of in our last report has been continued with the best results. At our fair in September last, the show of sheep has, perhaps, never been equaled, and certainly never excelled in Ohio, whether we take into consideration the quality and quantity of the fleece, or the character and number of the specimens. The exhibition of 81 fleeces of wool by Geo. W. Pollock, Esq., was certainly not only a novel, but a very interesting presentation of the fact, that the wool growers' interest is best subserved by the selection of the finest breeds, and in the care and attention bestowed upon the flock.

The wheat crop of the past year has been of more than average quality, although the quantity was materially diminished by the severity of the weather in January last, the average per acre was about 12 bushels.

The corn crop of 1864 was far better than the severe drouth of the summer led us to anticipate. The rains in the latter part of August and in September caused many fields to revive, and the average throughout the county was about 35 bushels to the acre. Oats did well considering the drouth, averaging as is supposed about 30 bushels to the acre.

Potatoes suffered severely, and had it not been for what is termed "the second growth," would have been nearly an entire failure. But the suitableness of the weather in September and October, and the long continued favorable weather in the fall, enabled many to realize some proceeds for the labor and seed, perhaps, averaging 50 bushels to the acre; yet the tubers are not generally as perfect as they would have been under other and more favorable circumstances.

Sorghum still demands and receives increased attention, and the favorable indications mentioned in former reports of making it a permanent crop still continue, and the time is not far distant if the same increase continues, when this county will be principally supplied with syrup or molasses from this product alone. The quality of both crop and product is also improving.

Apples were abundant in quantity, although in many cases from the drouth and other causes, the quality was not superior; nevertheless the crop was a good one. There were no peaches; some pears, and a small crop of the smaller fruits.

Grapes are still receiving increased attention. Many fine specimens were at our fair, and the general crop was a good one.

The scarcity of laborers spoken of in a former report, continued with increased difficulty in carrying on the operations of the farm. A large increase of the products of the county would doubtless have been realized, had the opening of the year shown or promised that laborers could have been obtained.

On the whole, the year has been a good one, the farmer has been paid for his labor in the increased price he has received for his productions; and although the war has been and still is felt in the high prices of the necessary articles of consumption, yet the farmer, and indeed the whole community have reason to rejoice that "war's stern visage" is only seen by them in the reflex action of its bloody and more frightful presence in other places.

NOBLE COUNTY.

The eleventh annual fair was held at Sarahsville, Noble county, Ohio, on the 20th and 21st days of October, 1864.

Our fair this year, all things considered, has been a decided success, the receipts being more than for several years past. The exhibition of the various articles commonly exhibited was not very full, but still the people seem to take a deep interest in the agricultural pursuits of the county.

The wheat crop was something below an average; oats was a good crop, but little was sown. The corn crop like the wheat, on account of the drouth in June and July. The tobacco crop, something less than last year, and greatly inferior to the last year's crop in quality, but has sold much higher, perhaps one hundred per cent., selling in some instances as high as $15 per hundred pounds, though a portion of the crop is very inferior, being frosted and some frozen. A number of the farmers have greatly improved the stock of cattle and horses, but from the fact that stock of all kinds is high, it having been driven out of the county or slaughtered, we have to say that the number of all kinds is greatly reduced.

The potatoe crop was the best for many years; as for sorghum, there is plenty to supply all domestic demands, and the syrup is much better than last year. We have had the best crop of apples that was ever known in this county, and as to kinds and quality it is noticeable that this crop has been greatly improved. We have raised more flax than for fifteen years past. The wool of this county has been largely increased in quality and quantity; as for the hay crop, it was decidedly the best we ever raised.

As to the prospects of agricultural pursuits in coming years, we can scarcely decide; on the one hand, the government is drafting largely upon the labor of the county to put down this infernal rebellion, and the balance seem to be determined to find the river of oil which indications go to say lies under this county.

PICKAWAY COUNTY.

The twelfth annual fair was held at Circleville, September 21, 22 and 23, 1864. The attendance during the fair was large, and the total receipts largely exceeded those of several previous fairs. The entries for 1864 were about one hundred less than those for 1863.

Some classes were not represented at all, while others were quite full. The stock entries were not so full as could have been desired, but the scarcity of labor will account for this to a great extent. The mechanical department was a total failure. The ladies' departments were fully represented and of excellent quality. The committee on needle-work could not agree on the best specimens in this class, and so awarded a premium to all articles exhibited, which the board at a subsequent meeting allowed and paid. Floral and fruit hall, considering the poor season, made an excellent appearance.

The fair, from a financial point of view, was a decided success. The entries not being so numerous as for several former exhibitions, we had quite a respectable balance left after paying all expenses, and taking up several outstanding notes against the society. The society is out of debt, and will, no doubt, prove of great benefit in the future.

Corn and wheat are the principal crops of Pickaway county; oats, rye and hay are also raised to a limited extent. About two thousand acres of broom corn is also raised, and has proved a very profitable crop the past year.

PORTAGE COUNTY.

The nineteenth annual fair of the Portage County Agricultural Society was held at their fair grounds at Ravenna on the 21st, 22d and 23d days of September, 1864. The weather was fine and the attendance of visitors and exhibiters was large considering the circumstances of our country. The number of membership cards sold was one hundred. The show of cattle, horses, grain and vegetables was creditable to the society. The show in the floral department (may God bless our dear ladies, for unto them much of the credit is due) was most excellent, being decided by many of our oldest members to be the grandest exhibition of the kind ever on our grounds.

Our principal crops are corn, wheat, hay, oats and potatoes. The corn crop is exceedingly large in this county this year, but owing to the wet weather but little of it is husked.

The wheat crop was so badly winter-killed that it was mostly a failure. The hay crop was light owing to the late frost and dry weather. The oat crop was much larger than an average; potatoes very heavy, more than an average crop has already been gathered and a good half crop still remains in the ground. A good deal of sorghum was raised here this year. The average amount of wheat per acre for 1863, as reported in spring of 1864 by assessors, was fifteen bushels per acre; corn, thirty-eight and half bushels; potatoes, ninety-one bushels; hay, nineteen hundred per acre. For the the present year, I think corn will average sixty bushels per acre; potatoes, probably, one hundred and twenty-five bushels per acre (some varieties such as long pinkeyes and neshannocks, &c., were much diseased, but the Jersey peach blows are mostly sound and excellent); hay, I think, can safely be estimated at fifteen hundred per acre; on the whole, I think that the farm products are with us full an average this year. Pork is scarce and in great demand, owing to the fact that but very few swine were wintered in this county last winter. All things considered, we may safely say that we have a competency of the necessaries of life for ourselves, and much to spare to such as may want.

The quantity of cheese made here this year is larger than ever before, and when we consider the enormous price it has brought we must admit that the purses of our people are plethoric beyond anything realized heretofore; there was also a large wool clip here, which sold readily for from eighty-five cents to one dollar and five cents per pound, making another great source of income to our people, and in the whole, the past year has been to the people of our county a season of very great prosperity. Great advantage has been gained by our people both in stock, seed and culture by the knowledge they have obtained from the various agricultural reports which have made their way to their tables, and I think that most, if not all will readily admit that farming is no less a trade than any other branch of industry performed by human hands, hence the interest that our most thrifty agriculturists feel in assembling together and comparing proudcts and discussing the various modes of tillage, &c., &c. I am pleased to say that the science of agriculture has a wide-spread influence with us, yet I must sincerely believe that the farmer does not yet realize more than one-half the produce from the capital invested and the labor bestowed that he will when a more full and complete knowledge of tillage and drainage is by him obtained and practiced. I must not forget to state our society now numbers one hundred members and we hope another year to treble that number.

PREBLE COUNTY.

During the past year our society has not been in so flourishing a condition as has been usual with it. Excessive drouth throughout the first part of the season rendered nearly all of our crops short. Wheat was thin on the ground but very well filled, making nearly an average crop; oats, more than an average crop; hay, short; flax, an average; corn, little, if any, over a half crop; potatoes, not more than a half crop. Added to these deficiencies on account of the season, the one hundred days' service bore very hard on our farming community, thus making the yield of the county far below the average.

Our farmers are, however, in the best of spirits. The usual care has been given to improved tillage and to improvement in stock, and with hopes brightened by the continued success of our brave boys in the field, Preble county pledges to her sisters of Ohio an unabated zeal in the improvement of the farming interests of our noble State, and a determination that when war's alarms shall cease, she will devote herself anew to the promotion of the highest interests of her citizens through the dissemination of an improved knowledge of the cultivation of the soil.

RICHLAND COUNTY.

Owing to the state of the country, and especially in this county the impending of the draft, our late Fair—in September, 1864—was not a success. We note no special improvements in agriculture or household manufactures. Our farming community, however, are thriving now much more than ever before, and, with the dawnings of peace for the country, we have no doubt that the interest taken in agricultural pursuits will generally increase. The great want has been sufficient "help," owing to the calls of the Government for men to work in the great and good cause of putting down the rebellion; otherwise, the agricultural condition of the county is very prosperous.

SANDUSKY COUNTY.

The Thirteenth Annual Fair of the Sandusky County Agricultural Society, was held on the society's grounds in Fremont, on the 26th, 27th and

26th days of October. The attendance, owing to the weather and unsettled state of the country, was small. Number of members, 243.

The exhibition of stock of all kinds was small, but good. There were some very fine horses exhibited, and it is evident that our farmers are much interested in the improvement of that noble animal. The show of sheep was better than at any previous fair. There were also some very fine hogs exhibited. There was more competition in the poultry department than usual. The show in Mechanics' Hall was rather small. Farm Products Hall was well filled. The fancy articles, specimens of needlework, painting, &c., in Floral Hall, were all of a superior quality.

The crops in the county are better than was expected, after the severe cold winter and the drouth of the early summer.

SENECA COUNTY.

We made all arrangements to hold our Annual Fair during the last week of September;—arranged our premium list, amounting to between two and three thousand dollars, including many new features for our county, among which were $100 for the best trotting horse; a handicap trot; $25 for the best cultivated farm; extra premiums for animals, grain, seeds, farm and garden products, fruit, flowers, birds, agricultural machinery and implements, with the provision that the same be donated to the Society and sold at auction during the fair.

Through the kindness of Mr. Klippart, Secretary of the State Board, we obtained cuts to illustrate our book of premiums, which assisted in giving it a wider circulation. One hundred of these books will be distributed by the Hon. Wm. Lang (our delegate) at the meeting of the State Board—not because we think it perfect or original, but because we think that the Secretary's address, the rules and regulations, and premium list, contain something that may assist others in making their fairs more attractive.

All seemed to go on swimmingly until the President's call for 500,000 men appeared. This stopped the preparations for the fair, and all turned their attention to the raising of volunteers to fill the quota of our county. This state of affairs continued, and the board of directors, by a large majority, decided to postpone our fair.

Our principal crops are wheat, rye, corn, oats, barley, hay, timothy and clover seed. The wheat crop of Seneca county was rather more than an average, both in quantity and quality. The yield was about 16 bushels per acre, most of which has been sold at near $2.00 per bushel.

The yield of rye was about 12 bushels per acre, and sells for $1.50 per bushel; corn crop was about 35 bushels per acre, and sells for $1.00 per bushel; oat crop rather light, on account of dry weather in spring—price 65 cents; winter barley was a fair crop, say 30 bushels per acre—price $1.30. The hay crop was light, about 1 ton per acre, and selling now (Jan. 2d) for $20 per ton. Timothy seed sells for $5.00; clover $14.50. Sorghum and tobacco are raised in small quantities.

There is great improvement now going on in our fruit and stock. A fruit and stock farm near the city of Tiffin has now over 20 acres of fruit in cultivation.

Our agricultural interests are in a prosperous condition generally. Society numbers about 600 members.

SHELBY COUNTY.

The last week in September, in which our Fair was held, was one of almost incessant rain, to which may be attributed the comparatively small number of entries and thin attendance of people. The exhibition of horses was postponed for two weeks, at which time there was a fine show. The exhibition of Spanish Merino sheep was very fine; swine, none, and but few cattle. The household, horticultural, pomological, floral, cereal and mechanical departments were fair, though not as good as last year.

The corn crop of the county will average about 35 bushels per acre; oats about the same; wheat about 15; flax, 6 or 7 bushels. Early-planted potatoes yielded nothing; late ones were very good, though affected some with the rot. Hay, about ¾ of a ton per acre. 25,000 gallons or more of sorghum, of excellent quality, were made this year.

The proceeds, this year, did not equal the expenses. Nearly $350 were paid out in premiums. There are about 250 members.

STARK COUNTY.

This Society held its Fifteenth Annual Fair in the month of September, 1864. Although the weather was very unfavorable, the attendance was good. The exhibitions of stock was not very large, owing to the weather.

We have very fine, commodious grounds, in a good location, and nearly paid for.

Our grain crops were of excellent quality and average yield.

The quality of sheep in our county has been very much improved during the last year, and, owing to the high price of wool, many farmers are giving their sole attention to the raising of sheep of the best quality.

While much attention is being given to sheep, the improvement of cattle and horses has claimed and received considerable attention. Much improvement is going on in the way of agriculture. Farmers are having more taste in buildings, implements, stock, and mode of farming.

Considering the condition of our country, our Fair was a success, our receipts were much better this season than last, and our prospect for success and doing good is excellent.

List of members for 1864, 329.

SUMMIT COUNTY.

Our society has been very prosperous for the past five years, and as our treasurer's report shows a cash balance on hand of $2,336.79, it may safely be presumed that it is no inconsiderable interest in the society's welfare which would leave so large a balance and pay so liberal a list of premiums. Added to the above was as large a debt, contracted previously, all of which has been paid within the above period. Our last Annual Fair was pronounced the best ever held in the county, and the Society realized the largest amount of net cash ever received at any one Fair. Our price of admission has been very low, never until this year being more than one dime, while many Societies realize nearly as large an amount from a much smaller attendance. Sheep and horses on exhibition were largely in excess of previous exhibitions, and our show in those two branches of the stock department would do credit to any county in Ohio. The first day of our exhibition it rained some, but the second day was warm and pleasant, and continued to be until 11 A. M. of the third day, after which time the rain poured down in torrents. Senator John Sherman and Col. John C. Lee still held the crowd in the large Floral Hall until approaching night warned them home. We have about 300 members to our Society—a much larger number than heretofore. One of the strongest supports of our Society is the assistance and influence of our best citizens, who have always been ready and willing to keep alive the interest and promote its usefulness. Finally, we have accomplished this success by industry, energy and activity, which facts alone are among other prime causes of success in any private or public undertaking, and *vice versa*, are among the causes of failure in so many of our county societies.

Our principal crops are wheat and corn, although we raise a large amount of barley, oats, rye and buckwheat, with an occasional field of flax, beans or peas. We also cut a large amount of grass. I have no definite means at my disposal for the yield per acre of the different crops later than the assessors' reports of last spring; which reports, I presume, have been sent to the State Department ere this. Aside from our wheat being winter-killed, nothing disturbed it; good in quality, and probably one-fourth of a crop. Corn, oats and buckwheat good; grass light; good fall pasture and late frosts have added largely to the stock of feed on hand for the balance of the winter. There has been more improvement in stock and in agriculture in this county during the past five years than in the ten preceeding ones, and may we not hope, with such a stimilus, much larger and more beneficial results at the hands of our husbandmen?

TUSCARAWAS COUNTY.

The Annual Fair of the Tuscarawas County Agricultural Society, for the year 1864, was held on the 28th, 29th and 30th of September and 1st of October, on their grounds near the town of Dover. Although the elements appeared set in motion to keep the people away by being as wet and disagreeable as possible, till the people came; we had a Fair—the Fair a success, in many respects; our finances greater; our sheep display far better; our horse show improved; apples and grapes in abundance; and vegetables very good. The other departments were not so well filled.

Thoroughbred sheep from Mr. E. Hammond's and other flocks of Vermont was exhibited by our own people, and $1,000 was refused for one ram.

Tuscarawas will not fall behind her sister counties in the quality of her sheep. The wheat crop was very badly injured by the sudden and severe cold snap in January.

Hay, oats and barley good; corn a full average crop; clover seed a failure.

Premiums awarded, $656.

UNION COUNTY.

Wheat, average about 12 bushels per acre. The severe cold in January greatly injured many fields, from which they did not recover. Wheat drilled bore the extreme cold, and produced much better than that sowed broadcast.

Corn, average 30 bushels per acre. Corn planted on clay ground was almost totally destroyed by drouth in the early part of the season.

Oats were not extensively sown, but produced fair crops.

Hay, notwithstanding drouth, produced more than year previous.

Flax—Farmers are paying more attention to the culture of flax, and are raising fair crops.

Sorghum—A gradual increase of quantity and quality.

Potatoes—Crop unusually large; the whole growth was made within four weeks at the close of the season.

Apples—Large crop and fine quality.

The leading characteristics of the past season was a severe drouth, prevailing from seed time to the last of August, with the exception of a general rain the last of June. From September the season was remarkable for frequent showers, warm and favorable weather, and much later frosts than usual.

Number of members about 300.

WARREN COUNTY.

The Warren County Agricultural Society held their Annual Fair on September 28th, 29th and 30th, and October 1st. The display of farm implements, farm and dairy products, domestic manufactures and flowers, could not, in our opinion, be excelled at any County Fair in the State. Our display of fruit was not so good, owing to a general failure of the crop; still we had a liberal display of apples and grapes.

Regarding horses, we can surpass any horse-ring in America. We had 150 or more horses on the grounds, and the result was, we were compelled to have a second Fair on the 10th and 11th days of October to satisfy exhibiters in that class; at which we offered premiums amounting to $250, and netted by the exhibition $180. The display of cattle was good, but, when we come to hogs, we can beat the world, and *old Butler county beside!* The display of hogs was the finest ever on the grounds. The display of sheep was good, although that is not a speciality with us. We had no competition for premiums on crops. The principal crops raised are wheat, corn, barley, oats and potatoes—some sorghum. Wheat yields 17 bushels per acre; corn, 45 bushels; barley, 30 bushels; oats, 35 bushels; hay, 2 tons; potatoes, 80 bushels. Our Society is, at present, in better condition than ever before; has 1300 members; owns 30 acres of ground; has a fine hall, erected this year, at an expense of about $2000. We have paid in premiums $800 and other expenses $1500, in all $2300. Our receipts from all sources is $2400, leaving a debt of $900, which, they doubt not, they can liquidate next year. In fact, we could have cancelled all obligations during our last Fair had the weather not been so unfavorable.

WASHINGTON COUNTY.

No Fair this year, nor in 1863. Our Fair grounds have been so occupied for military purposes, and so damaged, as to render them unfit for use without large expense. No election of officers since 1861. Not interest enough in the Society to hold a legal election, owing to the war and the scarcity of laborers. The public mind is occupied, to the exclusion of this interest.

WAYNE COUNTY.

The 15th Annual Fair of the Wayne County Agricultural Society was held on the ground of the Society on the 28th, 29th and 30th of September, and 1st day of October, 1864.

From the interest manifested by the citizens of the county and the members of the Society, the Board of Managers contemplated having a very beneficial and profitable exhibition at their annual communication. All felt encouraged, from the interest taken, that there would be a good time generally, and that it would be a farmers' festival indeed. But unfortunately, on the first day of the fair it commenced raining, and continued raining more or less the second and third day; consequently the Board of Managers concluded to continue the fair for another day; had posters struck and circulated that the fair would continue on the first day of October. But this did not stop the rain, as it continued more or less on the 4th day. Our fair was over, the clouds disappeared, and the sun again appeared in the heavens in all his majesty and beauty.

The elements have interfered very materially with the progress of our society for the two past years. Yet we will trust in an all-wise Providence to furnish fine fair weather in the future *for our fairs.*

The Board of Managers have no grounds for complaint towards the citizens of the county, as they manifested an unusual degree of interest, from the number of entries that were made, which amounted to about one thousand, and doubtless would have reached fifteen hundred had the weather been favorable. The membership was largely augmented over the previous year, numbering 416. The managers have leased four acres of ground adjacent to the former grounds, that with many other improvements contributed very materially to the comfort and convenience of exhibiters and visitors. Our grounds now contain 12 acres, with running water passing through it, and otherwise being well adapted to fair purposes, and lying within the corporate limits of our beautiful and prosperous village.

The articles on exhibition in many departments were very creditable, with a marked improvement in some. The entries in horses and mules were very large, numbering 140, composed mainly of good, large, substantial stock, for which this county has considerable reputation with eastern buyers.

The entries of cattle were not so numerous as some former years, owing to the shortness of pasture, caused by the severe drought that prevailed during the three summer months. What was on exhibition was very good stock, being of Durham and Devon breeds.

Sheep in number was not very large, but quality was very fine. Quite a strong competition is manifested between the wool growers of this county, each striving to excel his neighbor in quality and excellence. Wool growing has become a very important and profitable branch of our farming interest.

Hogs were not very fully represented, showing an indifference with the hog growers; and I think there is a great falling off in the number of hogs in the county, compared with former years. The price now ranges very high—from $10 to $11 per cwt. gross.

There were some very fine specimens of both white and red wheat on exhibition, yet the wheat crop in the county was almost an entire failure, owing to the severity of the winter, which froze the wheat in the ground. I am of the opinion that the crop in the county did not average four bushels to the acre.

The corn crop was also much injured by the long drought, running almost through the entire corn growing season. Will not average perhaps over 25 bushels to the acre; yet there were some very fine samples on exhibition.

Oats suffered in like manner; crop light—say about 30 bushels per acre.

Barley was likewise injured; crop perhaps 20 bushels per acre.

The potato crop was pretty largely increased in quantity planted; but kept back by dry weather. When the rains came, a rapid and vigorous growth ensued; were not ripe when the frost appeared; rot set in, and most all of the finest varieties have been lost thereby. Many fields have not been deemed worth raising. The inferior qualities suffered less damage. Perhaps not one-fourth of the crop has been saved to this date.

The hay crop was light—will not exceed 1¼ tons per acre. Price higher than ever known here before, being from $18 to $22 per ton, as to quality.

There have not been any field crops put upon exhibition, except for corn-fodder.

The vegetable department was not very well represented; yet what was exhibited was good. In mechanics' department the entries were large, but articles on exhibition were few, owing to the bad state of the weather.

The ladies' departments were full, showing a large increase of entries in domestic substantials, such as cloths, satinets, flannels, linens, tow and cotton cloths, carpets, stockings, socks, gloves, yarns, threads, &c., together with quilts, "both ornamental and substantial," blankets, and hundreds of other useful and substantial articles of their industry, besides an abundance of the beautiful and ornamental, which aid so much in beautifying and embelishing Floral Hall, that being the great point of attraction for all visitors—showing that woman's ingenuity and industry are always foremost in promoting the useful and beneficial enterprises of the day.

It would not be doing justice to the ladies—"God bless them"—to pass by unnoticed the large amount of *most* excellent family bread, both white and brown, with beautiful pans of light biscuit, and interspersed within the lot were some fine large spungy corn pones. This served to attract particular attention, as almost every passer-by must have a small slice to test the quality. The result was, the owners were not troubled in taking any of that article home. In the article of butter, a large number of entries were made and on exhibition, proving to be of the very choicest quality. I think the good housewives of old Wayne may very justly boast of no superiors and but few equals in the line of fine, soft, white, spongy bread and biscuit, and choice, hard, yellow, rich, sweet butter. We have no fears of being excelled in that line.

The exhibition of apples was very large, that being the only kind of fruit raised in this county of any consequence this year. The quality was good: the crop unusually large. Our varieties are perhaps not of the finest qualities grown, but generally good, such as Seek-no-further, Spitzenberg, Belleflower, Morningbeam, Foldewalder, Rambo, Butter apples, Gilliflower, various kinds of Pippins and Russets, with many other kinds not so well or favorably known. Of late years the finer and better varieties from the eastern nurseries have been extensively introduced, and are now beginning to show their quality, which bids fair to be a valuable improvement in fruit growing.

The grape crop was not so good as last year, having been injured in the bud from the severe cold the previous winter; yet there were some very fine samples on exhibition. Grape culture in this county is largely on the increase.

The smaller fruits, such as strawberries, blackberries and raspberries, did not succeed well last season. The fruit was not perfect, nor of fine flavor; attributable to the very dry weather. The fruit dried up before it came to perfection.

I have no hesitancy in saying that this Society has been of such manifest and extensive usefulness in the county that its friends in agriculture and all industrial departments are resolved to sustain it.

WYANDOT COUNTY.

The Wyandot County Agricultural Society held its Eleventh Annual Fair, on the society's grounds at Upper Sandusky, on the 18th, 19th and 20th days of October, 1864. Hundreds of our young men having left the county during the past year and joined the army, to aid in putting down the rebellion that is upon us, it was thought by many that we could not hold a fair. Notwithstanding the many that had left the county, great numbers were in attendance during the fair, which is evidence to us that the people of Wyandot county still have an interest in agricultural exhibitions. The number of entries was about the same as last year. The weather was very fine during the fair.

Our Fair, taking every thing into consideration, was a success. The driving park was very attractive—at least to a great portion of the people present. Many of the horses shown at this fair would very favorably compare with a great many of the horses exhibited at the State Fair. We had a fine display of cattle, of different grades. Our show of sheep was the best ever exhibited in the county, many grades and qualities being there. All the other departments were very well represented, especially farm and garden products were very fine.

The principal products for export are stock, wool, corn, wheat, clover-seed, timothy-seed and hay.

The following are the crops raised and about their average yield, per acre, for this year: Wheat, 15 bushels; corn, 35; rye, 20; oats, 30; buckwheat, 15; barley, 25; potatoes, 200—rotted badly; clover-seed, 3; timothy-seed, 4; hay, 1½ tons.

There was no competition on field crops. We number 150 members.

INDEPENDENT SOCIETIES.

UNION AGRICULTURAL SOCIETY OF JAMESTOWN, GREENE COUNTY.

Our Society, being located near the eastern boundary of Greene county, is, properly, a district society, composed of the counties of Greene, Clinton, Fayette, Madison and Clark.

Although one or two of the above counties have not taken the interest they should have done, in the annual election of the board of managers, yet they have always exhibited liberally, and attended largely, at our annual exhibitions.

The location of the society was for the purpose, in part, of developing the agricultural resources of a large portion of the counties composing it. The interest taken by the people in our fairs, shows very clearly their determination to sustain them. This is manifested by entries of stock, of all kinds, and articles in all other departments. The number of horses entered has ranged from 350 to upwards of 400; cattle from 60 to 80. Sheep and hogs have always been well represented, and the total number of entries for each fair has been from 1200 to 1500. There have been decided improvements in all kinds of stock since the organization of the Society.

There has been no improvement in the general exhibition of Short-horn cattle; yet some of the individual exhibiters have improved their breeds and increased their number, since our first fair. All the other departments have greatly improved their herds.

We deem it unnecessary to report the average amount of the different crops per acre, as that is reported by the county societies.

Our finances are in a healthy condition. The society was started on the voluntary contribution of $1000, from the inhabitants of the village of Jamestown and surrounding country. We have inclosed a fair ground, with a high plank fence, containing near 17 acres; put up 300 stalls for stock, besides pens for sheep and swine; a floral hall, 36 by 20 feet; a mechanics' hall, dining hall, and other improvements. Our premium list foots up about $1600. It is the intention of the board to increase the premiums for the coming exhibition, as there is now in the treasury $802.23, after all expenses are paid. We have made no spasmodic increase of our premiums, for one exhibition, to $2000 or upwards, and then fallen back to $800 or $1000, but we have steadily increased since the first.

Our society is not a joint stock affair, but the People's Society—the surplus funds going into premiums, or to be saved for the purchase of grounds, after the expiration of the term of the lease of the present grounds.

The people greatly enjoy our annual social gatherings. Our last Fair was held, on the society's grounds, August 31st and September 1st and 2d, 1864, and, in every thing, a complete success.

Officers of the Society.—Robert Brown, Pres't; J. G. Clemans, Daniel Marshall, Vice-Presidents; John W. James, Rec. Sec'y; J. C. Galloway, Cor. Sec'y; Morris Sharp, Treas'r. Directors—J. H. Jobe, W. A. Rogers, James McKillig, G. L. Correll, D. T. Colvin, Wm. Linkhart, G. C. Palmer, G. C. Clemans, Josiah Thornbury.

UNION AGRICULTURAL SOCIETY OF WELLINGTON, LORAIN COUNTY.

The Ninth Annual Fair of the Union Agricutural Society of Wellington, Lorain county, was held Sept. 28th, 29th and 30th, 1864, on their fair grounds in Wellington. No efforts were spared to have a great and good fair. The officers, a few weeks before the fair, announced that their whole income, after paying premiums and expenses, should be given for the benefit of the sick and wounded soldiers. The members were invited to bring in things to send to the hospitals, and also to bring large quantities of provisions to the soldiers' dining hall. The invitation was well received, and nobly responded to.

Every thing seemed promising for the largest fair ever held on our grounds; but the weather was against us. It rained every day, and some of the time very hard. Notwithstanding the weather, the people came in crowds, and the attendance was nearly as large as usual.

The number of entries (603) was very much less than usual.

The stock on exhibition was very fine; and of sheep there was the largest and best show we have ever had.

We have 676 members.

Financially, our Fair was a success. The net receipts were $1584.56, besides a large amount of things brought in to send to the hospitals.

We have paid over $500, cash, to the U. S. Christian Commission, and shall probably have about $300 more for the soldiers, after paying the premiums; many of which were donated to the society, for the soldiers.

The wheat crop was almost a total failure, being killed out by the severe cold of January. Oats were much better than usual; corn and hay about usual. Potatoes, large yield, but rotted badly. Apples abundant, good; no peaches, and but few pears or cherries.

Principal business of farmers in this section, dairying, keeping sheep, and raising stock. Very little grain raised, except for home consumption.

S. D. WHITNEY, *Pres't.*

E. M. HOUGHTON, Sec'y.

UNION AGRICULTURAL SOCIETY.

The Ninth Annual Fair of the Union Agricultural Society was held at the Fair Grounds, in Twinsburgh, Summit county, September 7th, 8th, 9th and 10th, 1864, and, although the weather was very unfavorable, and the rain had made the grounds a "mortar-bed," almost, yet the attendance was very good, and the people came in crowds. And, although many circumstances were against a Fair—war in the land, and the people just recovering from a drain upon the pocket to supply volunteers to fill the call for troops to put down the rebellion—yet it seemed that the people did not grow weary, but, with true native determination, had a Fair that proved very satisfactory to all concerned.

In consideration of the location of our section of country for material to support a Fair, it is unequalled; in the centre of a very prosperous dairy district, surrounded by five townships, which, for the making of butter and cheese, are unequaled in quantity in the same space in this country, if not in the world; and the standard of our cheese and butter is being elevated year by year, so that now it vies with the best York State dairy in quality when put side by side in market. There has probably been made in the past year in this township and the five surrounding over 2000 tons of cheese, and butter in proportion.

The corn and potato crop was good this year; hay and oats a fair crop, although it might be said oats were very good. A good deal of attention is being shown in the raising of fruit, and a good show is made every year. Grapes, and wine from the grape, as well as the cherry, currant, etc., are receiving attention.

The show of horses not large; cattle good. A good deal of attention is being given to sheep at present, and some very fine flocks have taken the place of dairy cows.

The receipts this year from the Fair was $485.32.

The Society consists of 500 members, and have a deed of nine acres of land for Fair Grounds, with buildings appropriate, with a good ring, and water brought in pipes from a spring. Taking all things into consideration, the Society is in a good condition.

A. V. BISHOP, *Sec'y.*

TWINSBURGH, O.

STATEMENTS OF FARM CROPS.

Ashtabula county, O.

Soil clay, and much broken up in spring of 1862, planted in corn two seasons, plowed in spring of 1864, about first of June, and sowed in oats broadcast, four bushels to the acre; seed common white oats; amount of ground, one acre; yield, 60 bushels.

J. C. Stevens.

Ashtabula county, O.

I measured an acre of my corn ground, and husked two-thirds of the same, and got one hundred bushels of ears of corn. The ground had been in meadow some years; broke it up the last of April from eight to ten inches deep with three horses abreast, let it lie until first of June, harrowed, and then rolled it, planted the 8th with West & Kellogg's hand corn-planter, rows three feet ten inches each way; as soon as it was large enough I cultivated it twice in row each way with Parson's patent horse hoe, which was all that I did with it until I cut it the last of September.

C. P. Forbes.

Ashtabula county, O.

I raised one acre of corn, from which I husked 116 bushels of ears; planted on the 25th of May, in rows four feet apart each way; soil gravelly loam; cultivated three times and howed once; cost of cultivation and plowing, $2; harrowing and marking, $1; planting and seed, $2.50; cultivating, $2.50; one day hoeing, $1.50. Total, $9.50. Stalks and pumpkins for harvesting. 116 bushels at 50c.—$58; profit, $48.50.

I also raised one-fourth of an acre of potatoes, from which I harvested 54 bushels of good sound potatoes, "Peach Blows," planted first of May, three feet apart each way, soil gravelly; cultivated twice and hilled up with horse hoe. Paid for use of land after it was plowed, $2.50; planting and seed, $1.75; cultivation and hoeing, $1; digging, $2. Total, $7.25. 54 bushels at 50c.—$27; profit, $19.80.

Gentlemen—From observation and experience, I have come to the conclusion that the best and cheapest mode of fertilizing the great body of the soil cultivated, is by plowing down green crops, and that red clover is the best crop that can be grown or raised for that purpose. In consequence of its rapid growth, two crops will fully mature in one season, and by the following described management there can be two crops of grain and one of hay harvested from the same field in three years, and one crop of clover to plow under. This, in my opinion, will raise it again to its former fertility, and in this way, by the application of what stable and barn manure that can be obtained on a farm on the poorest spot, land may be kept up to its former stage of fertility, or very nearly so, and one crop be harvested from it every year.

THE MODE OF MANAGEMENT.

Plow your field and sow it in wheat in the fall, or in oats in the spring; sow your clover seed on your growing wheat in the spring, or on your oats when you sow them; harvest the wheat or oats, pasture your clover but little or none that fall, and none the next spring. In June you may harvest a good crop of clover hay, which, if well saved, has, in my opinion, more nourishment in it than any other kind of hay, and when your second crop of clover comes fully to maturity plow it under, let it lie over winter, plant it in corn next spring, and you will have a good chance for a corn crop. Thus you perceive you get a crop of oats or wheat, a crop of hay, and a crop of corn in the three seasons to harvest, and one of clover to plow under. There is no mode more advantageous than the foregoing that has ever come under my observation, and especially to farmers who have but a small quantity of land, and therefore cannot let it rest without tilling.

The foregoing views are respectfully submitted for your consideration.

H. T. RINEHART.

State of Ohio, Clark county, ss.

Richard Collier and Samuel Fryant being duly sworn, say they accurately measured the land upon which Absalom Pownell raised the crop of corn which he enters for the premium offered by the Clark county agricultural society for the year 1864, and that there was one acre and no more; and that there were (89) eighty-nine bushels and (10) ten pounds.

COST OF RAISING.

Three loads of manure, 25c. per load	75
Plowing and harrowing one day	$2 00
Planting one day and a half	1 00
To one-fourth bushel seed, $1.00 per bushel	25
To one day and a half cultivating	1 50

RICHARD COLLIER,
SAMUEL C. FRYANT.

Sworn to before me this 9th day of December, A. D. 1864.

DANIEL BAKER, J. P.

Absalom Pownell being duly sworn, says he raised a crop of corn on the land measured by Richard Collier and Samuel Fryant; that the product weighed in the presence of Richard Collier was all raised on said land, and that the accompanying statement of the manner of cultivating and the cost is correct to the best of my knowledge.

ABSALOM POWNELL.

Sworn to before me this 9th of December, A. D. 1864.

DANIEL BAKER, J. P.

State of Ohio, Clark county, ss.

Richard Collier and Samuel Fryant being duly sworn, say they accurately measured the land upon which John A. Collier raised the crop of corn which he enters for the premium offered by the Clark county agricultural society for the year 1864, and that there was one acre and no more; and that there were (93) bushels and (50) fifty pounds.

COST OF RAISING.

One day plowing and harrowing	$2 00
Planting one day and a half	1 00
To one-fourth bushel seed, $1.00 per bushel	25
Cultivating one day and a half	1 50

RICHARD COLLIER,
SAMUEL C. FRYANT,

Sworn to before me this 9th day of December, A. D. 1864.

DANIEL BAKER, J. P.

Brown township, Delaware county, Ohio, ss.:

Frederick Williams, being duly sworn, says he accurately measured the land upon which John L. Thurston raised a crop of sorghum the past season, and the quantity of the land is one-fourth of an acre, and no more.

Sworn to before me, this 25th day of November, 1864.

WM. WILLIAMS, J. P.

DESCRIPTIVE REMARKS.—Soil a rich sandy loam, never tilled before; plowed about the first of March, six inches deep; ground well harrowed; planted about the 18th of May, in drills four feet apart; quantity of seed, one pint, soaked five days in warm water prior to planting; hoed as soon as perceivable in the rows; plowed and hoed three times; third hoeing thinned to six inches apart in the rows, being careful to remove all the succors; cut when fairly ripe; ground in the usual manner and reduced to the consistency of molasses on one of Cook's evaporators; cost of cultivating and manufacturing, $30.90; plowing and preparing ground, $2; plowing and hoeing, $6; cutting and stripping, $4; manufacturing, $18.90; total, $30.90.

John L. Thurston, being duly sworn, says that he raised a crop of sorghum the past season upon the land measured by Frederick Williams, and the quantity of molasses raised thereon was sixty-three gallons, and no more; and the statement in regard to the manner of cultivation, etc., is correct, to the best of my knowledge.

JOHN L. THURSTON.

Sworn to and subscribed before me, this 25th day of November, 1864.

WM. WILLIAMS, J. P.

Delaware county, ss:

George Nelson, being duly sworn, says he accurately measured the land upon which he raised a crop of potatoes the past season, and the quantity of land is one-fourth of an acre, and no more.

Sworn to before me, this 23d day of November, 1864.

M. SACKETT, J. P.

George Nelson, being duly sworn, says that he raised a crop of potatoes the past season upon the land measured by himself, and the quantity of potatoes raised thereon was 57½ bushels, and no more, measured in a sealed half bushel; and the statement in regard to the manner of cultivation, etc., is correct, to the best of my knowledge.

GEORGE NELSON.

STATEMENT.—No manure was used; the soil black loam; second plowing after clearing; the seed used 1½ bushels blue neshannock; very small seed; planted May 25th, 1864; three pieces in a hill; two eyes each; in regular hills, three feet apart, deep covered with hoe; expense for plowing and tending, $5. All which I certify to be correct.

GEORGE NELSON.

Delaware county, ss.:

George Nelson, being duly sworn, says he accurately measured the land upon which he raised a crop of sorghum the past season, and the quantity of land is one-fourth of an acre, and no more.

Sworn to before me, this 23d day of November, 1864.

M. SACKETT, J. P.

George Nelson, being duly sworn, says that he raised a crop of sorghum the past season upon the land measured by himself, and the quantity of molasses made thereof was — gallons, and no more; and the statement in regard to the manner of cultivation and manufacture, etc., is correct, to the best of my knowledge.

M. SACKETT, J. P.

Statement.—No manure used; soil black loam; the quantity of seed used two quarts; planted 22d of May, 1864; planted in three feet square hills with the hoe; covered one inch deep, and tended both ways, with horse once, and hoed three times and succored three times; whole expense $8. All which I certify to be correct.

George Nelson.

Brown township, Delaware county, Ohio, ss.:

Frederick Williams, being duly sworn, says he accurately measured the land upon which John L. Thurston raised a crop of potatoes the past season, and the quantity of land is one-fourth of an acre, and no more.

Sworn to before me, this 25th day of November, 1864.

Wm. Williams, J. P.

Descriptive Remarks.—Soil a sandy loam; one crop raised upon it (broom corn) the season previous; ground plowed about the 10th of May; planted the 15th of the same month, in rows three feet wide one way by two the other; plowed with double shovel, and hoed when two inches high, covering the tops entirely over two inches deep; after that plowed and hoed twice; dug about the middle of October, and measured in a sealed half bushel; amount of seed planted, 2½ bushels; variety planted, spotted or blue neshannocks.

John L. Thurston, being duly sworn, says that he raised a crop of potatoes the past season upon the land measured by Frederick Williams, and the quantity of potatoes raised thereon was fifty-one bushels, and no more; and the statement in regard to the manner of cultivation, etc., is correct, to the best of my knowledge.

John L. Thurston.

Sworn to and subscribed before me, this 25th day of November, 1864.

Wm. Williams, J. P.

Crop of potatoes raised by Gurdin Perrin, of Milan, Erie county.

The land was measured by myself, assisted by Henry Wise and Judson Perrin, and the quantity of land was half an acre, and no more. The quantity of potatoes raised on said half acre was one hundred and sixty bushels and thirty-one pounds (160 31-60 bushels,) by weight 60 pounds per bushel. The soil is sand mixed very little with gravel, and was in wheat last year. They were planted about the middle of May, in rows about three and a half feet apart and from two to two and a half feet in the rows, with two different varieties, viz: Shaker Russets and Jersey Peach Blows, about half of each kind. There was no perceptible difference in the yield. They grow a uniform size, very few small potatoes among them. I sold a load of forty-seven bushels and assorted them, and we got but one bushel of small ones; the rest were all suitable for table use. But I give the Shaker Russets the preference; they are the best potato for table use that I ever saw; they boil dry and mealy, and have an excellent flavor, good yielders, free from rot, and grow a uniform size. These qualities combined, I consider them a very desirable potato for every farmer and gardener to raise. The quantity of seed used was five bushels, cut, and two pieces to each hill. I hauled five loads of coarse manure on the ground, spread it and plowed it under, and used about three-fourths of a bushel of plaster, dropped a little in each hill when they were planted. The ground was marked with a light plow and one horse, the seed and plaster dropped, and the furrow turned back again by the same horse. I cultivated them twice and hoed them once, which was all the labor bestowed upon them until they were dug.

ITEMS OF EXPENSE.

To five loads of coarse manure, at 25 cents per load	$1 25
To plowing and marking one-half day	1 25
To five bushels of seed, at 75 cents per bushel	3 75
To three-fourths of a bushel of plaster and dropping by a small boy	50
To dropping the potatoes and covering with a horse	1 00
To cultivating twice and hoeing once	1 00
To digging and picking up 160 31-60 bushels at three cts. per bus.	4 81
	$13 56
Credit by 160 31-60 bush. at $1.00 per bushel	$160 51
Net profit on one-half acre	$146 95

As the price looks large, I would here state that I sold over 1,000 bushels this fall at the above price—a part of them in the field, the balance delivered to Norwalk.

Milan, Erie county, ss.:

G. Perrin, Henry Wise and Judson Perrin, being duly sworn, say they accurately measured the land upon which the above crop of potatoes was raised the past season, and the quantity of land is one-half an acre, and no more; and they also state that they weighed the potatoes and there were 160 31-60 bushels raised on the above described half acre, and the statement in regard to the manner of cultivation, etc., is correct, to the best of our knowledge.

GURDIN PERRIN,
HENRY WISE,
JUDSON PERRIN.

State of Ohio, Erie county, ss.:

Sworn to and subscribed before me, the 23d day of January, A. D. 1864.

SETH JENNINGS, J. P.

Report to the Committee on Crops of Harrison county:

GENTLEMEN:—I plowed nine acres of meadow land in the month of April last, with a No. 8 iron plow, and in the first part of May I harrowed it four times in order to have it in a proper state of cultivation, and on the 21st and 22d I listed it, running the rows north and south and east and west, at the distance of three feet apart each way, and on the 23d and and 24th I planted it, putting two bushels of seed on the nine acres. When it came up I cultivated it with a cultivator the first time and the second and third time used an iron shovel plow, using the hoe only in exterminating weeds about the hills. I cut up the crop the last week in September and first week in October, the shocks containing from 64 to 80 hills, and on the 24th of October I employed two competent persons to measure one acre and husk the same, from which we obtained one hundred and nine bushels of corn of good quality, measured by the usual standard measure. It took two days in plowing, harrowing and planting; two days in cultivating; one and a half days in cutting, and six days' work for one hand husking and housing. The quantity of seed was nearly one peck; quality of land was alluvian bottom and sandy; no manure used. I also employed the same persons to measure five acres of the same bottom, and it was found to produce four hundred and seventy-five bushels, or at the rate of ninety-five bushels per acre, the falling off occasioned by a swale running through said bottom; the quality of land the same as above; seed over one bushel; and the other particulars the same in proportion as in the first acre mentioned.

Yours, etc., JOHN FINICAL.

The State of Ohio, Harrison county, ss.:

Personally appeared before me, Aaron Conaway, a Justice of the Peace in and for said county, David P. Stewart and Lafayette Martin, who made solemn oath that they measured one acre of corn in John Finical's cornfield, and husked and measured the corn, and found said acre to contain one hundred and nine bushels of corn; and deponents further state that they measured five acres of corn in the same field and found it to contain four hundred and seventy-five bushels of corn, or ninety-five bushels per acre.

D. P. STEWART,
LAFAYETTE MARTIN.

Sworn to and subscribed before me, this 26th day of October, 1864.

AARON CONAWAY, J. P.

The following is the estimated cost and profit of the above crops:

On one acre.		One five acres.	
Interest on land	$4 50	Interest on land	$22 50
One day's plowing	2 00	Plowing	10 00
One-half day harrowing	1 00	Harrowing	5 00
Listing and planting	75	Listing and planting	3 70
Seed	25	Seed	1 25
Cultivating and board	4 00	Cultivating and board	20 00
Cutting up	1 50	Cutting up	7 50
Husking and housing	6 00	Husking and housing	30 00
Inc. exp., including board.	3 00	Inc. exp., including board.	15 00
Total expenses	23 00	Total expenses	115 00
109 bushels of corn in field, worth 90 cents per bush.	$98 10	475 bushels of corn in field, worth 90 cents, is	$427 50
Deducting expenses, leaves a net profit of	75 10	Deducting expenses, leaves a net gain of	312 50
And fodder.		And fodder over.	

Respectfully submitted,

JOHN FINICAL.

Five acres of Corn raised by Wm. Hedges, Jr., of Arthur township.

The soil is a black loam; all but three-tenths of an acre is ridge land. No manure of any kind was used. The plowing was about the first week in April, and to the depth of about seven inches; planted about the first week in May; rows three and a half feet apart; hills twelve inches apart in the rows. The cost of cultivating this crop is as follows:

Five days' plowing, at $2.50 per day	$12 50
One day's harrowing, at $2.50 per day	2 00
Cost of planting, $1 per acre	5 00
One and one-fourth bushels of seed	1 50
Plowed four times through	7 50
Husking and cribbing, at $4.25 per acre	27 25
	$50 25

PROFIT.

Two hundred and ninety bushels of corn, at $1	290 00
Net profit	$239 75

The State of Ohio, Harrison county, ss.:

Before me, Jacob Jarvis, the County Surveyor in and for said county personally came Wm. Hedges, Jr., John Brough and Thos. Brough, and made solemn oath that the above report is true, to the best of their knowledge and belief.

JACOB JARVIS, County Surveyor.

I hereby certify that on the 26th inst., at the call of Wm. Hedges, Jr., I, aided by John Brough and Thos. Brough, proceeded to measure the above five acres of land, upon which the said Hedges raised a crop of corn, and certify that the measurement was done correctly.

JACOB JARVIS, County Surveyor.

One acre of Corn raised by William Hedges, Jr., of Harrison County.

The soil is a black loam, and lies in the bottom. No manure of any kind was used. The plowing was done about the first week in April, and to the depth of about eight inches. The planting was done about the first week in May, the rows about 3½ feet apart, and the hills about twelve inches apart in the row.

COST OF CULTIVATING THE CROP.

One day plowing	$2 50
Harrowing and planting	1 50
One peck of seed	31
Plowed through with a double shovel, four times	1 50
Husking and cribbing	4 25
Total cost	$10 06

CREDIT.

Fifty-eight bushels of corn, at $1	$58 00
Net profit on the crop	47 94

State of Ohio, Harrison County, ss.

Before me, Jacob Jarvis, the County Surveyor, personally came W. Hedges, Jr., Jno. Brough, and Thomas Brough, and made solemn oath that the foregoing report is true to the best of their knowledge and belief.

Oct. 28, 1864. JACOB JARVIS, County Surveyor.

Oct. 28, A. D. 1864. I hereby certify, that on the 26th inst., I, aided by Jno. Brough and Thomas Brough as chainmen, proceeded to measure one acre of corn ground for W. Hedges, Jr., and certify that it was correctly done.

JACOB JARVIS, County Surveyor.

One half acre of Northern Sugar Cane raised by A. H. Wrenn, of Morrow County.

The land has been a pasture lot. Raised two crops of corn previous to the cane crop. Is what is usually called beech and elm soil; surface rather flat; soil dark—somewhat loamy; subsoil stiff clay.

Plowed about the middle of May, from seven to nine inches deep. Harrowed until thoroughly pulverized. Planted with dry seed on the 21st of May—drilled in with a corn drill. Owing to the ground being very mellow, and the drill running so deep, I was fearful that the seed would not see daylight; consequently, having plenty of seed, I put in an abundance of it; but to my surprise, although planted during the drouth, it came up without any rain, very thick, and grew very well during the drouth of several weeks; while corn in the adjacent field nearly perished. So much in favor of deep plowing. The seed was of the Chinese variety, obtained from the southern part of this State. During cultivation the cultivator was used only once, and the double shovel plow once, and was thinned out and hoed. The ground remained clean and mellow all season.

The cane was cut and put in large shocks from the 10th to the 12th of October, after receiving one light frost. After remaining in shock curing between three and four weeks, I hauled one load—being one-seventh of the half acre—to the scales. It weighed 2,600 lbs., making 9 tons to the half acre—equaling 18 tons per acre. Had the seed been ripe (none of it matured) it would have weighed considerably more.

In consequence of making molasses for my neighbors, and doing other work, I did not work up the last of my cane until the 29th of November; therefore I did not get quite as much molasses as if manufactured earlier; part of it was frozen hard, and I had to wait until it was thawed. I saved an immense amount of well-cured fodder; had it hauled in, stripped and topped immediately before manufacturing. I threw out a large amount of the small cane, leaving at least one-half the weight in small cane, blades and tops, which I consider equal if not better than any other rough feed. I had about two acres in cane, but not all as good as the half acre. I have been feeding three horses and two cows on it for the last five or six weeks. They have done well, although my horses worked hard the most of the time. They did not require as much grain as when fed on hay. I have fodder enough for several weeks yet. While manufacturing, nine head of hogs did well on the bagasse and skimmings, with but very little other feed.

The following is an estimate of the expenses and also proceeds:

By 115 gallons very thick molasses, at $1.10	$126 50
" 4 tons fodder..	32 00

By scum for hogs		$6 00
" value of bagasse for hogs and manure		6 00
		$170 50
To value for ground rent	$2 50	
" plowing and harrowing	2 00	
" planting	50	
" cultivating, hoeing and thinning	2 00	
" plowing with double shovel	50	
" cutting and shocking	2 00	
" hauling in	4 00	
" stripping and topping	8 00	
" manufacturing, at 30c. per gallon	34 50	
		56 00
Net profit		$114 50

The cane being blown down caused more labor in cutting and hauling than if it had stood up. The deep plowing, and the ground being very wet, caused unnecessary labor in hauling. Had the cane ripened, the proceeds would have been much greater. The butter made from the cows while eating the fodder, is very rich, but rather hard in cold weather.

Respectfully submitted,
A. H. Wrenn.

The State of Ohio, Morrow County, ss.

A. H. Wrenn, being sworn, says the foregoing statement is true as he verily believes. A. H. Wrenn.

Sworn to and subscribed before me, this 5th day of December, 1864.
E. C. Chase, Notary Public.

The State of Ohio, Morrow County, ss.

George Goodman, being sworn, says, that on one acre of ground, accurately measured, he raised, in the year 1864, ninety and three-quarter bushels of cane by measure, and ninety-six bushels by weight. That said ground was an old meadow, black loam, subsoiled in April, and planted May 5th. Rowed each way at a distance of 3½ feet by 4 feet. It received four plowings; no dressings with hoe.

George Goodman.

Sworn to by Geo. Goodman before me, and by him subscribed in my presence, this 10th day of December, 1864.
E. C. Chase, Notary Public.

The State of Ohio, Morrow County, ss.

H. H. Scribner being sworn, says: That on a piece of ground containing 5 and 125-160 acres, he raised a crop of corn averaging to the acre 104 28-100 bushels; that said field had been tilled but one year previous to the present; that the ground is a first bottom, black gravel loam; that said ground was plowed to the depth of 6 inches, rowed each way, distant about 3½ feet, and received two plowings, and one dressing with hoe slightly.

H. H. Scribner.

Sworn to before me and subscribed in my presence, this 10th day of December, 1864.

E. C. Chase, Notary Public.

To Morrow County Agricultural Society:

This is to certify, that in the beginning of May of the present year, I plowed a field of five acres, about 5 inches deep, on elm and beach bottom land; soil black loam, subsoil blue clay; pulverized thoroughly with a common harrow. About the middle of May planted in corn, dropped by hand and covered with the hoe, in rows 3½ and 4 feet. Cultivation was by plowing with a double shovel plow, twice in a row, 4 times; the average about 4 stalks to the hill. Cut and shocked the first week in October, and husked about the middle of November.

Cr.	By 410 bushels corn, at $75 cts.		$307 50
	Or 82 bush. per acre, " $61.50.		
Dr.	To rent of ground, worth	$30 00	
	Plowing ground	9 00	
	Harrowing	1 50	
	Furrowing out	1 50	
	Planting	3 00	
	Plowing corn	15 00	
			60 00
	Net profit		$247 50

Or a profit of $49.50 per acre.

The fodder pays for cutting and husking. The best acre measured 87 bushels, allowing four strong even half bushels for one of shelled corn.

E. H. Irwin.

Sworn to before me and subscribed in my presence, this 10th day of December, 1864.

E. C. Chase, Notary Public.

The State of Ohio, Stark County, ss.

Personally appeared before me, W. W. Clark, a justice of the peace in and for said county, John Miller, who being duly sworn, made oath as follows:

That he is the owner of a farm in the township of Perry, of said county; that in the fall of 1863, he put out on said farm a field of fifteen acres of wheat; that the following is a description of his method of cultivating said ground: It was fallow ground, and not manured; that the land was plowed from 8 to 9 inches deep; that said wheat was drilled in, about the 14th day of September, 1863; that said ground was twice harrowed before the wheat was drilled in; that said soil is a sandy, gravelly loam; that said field was once cultivated, after being twice harrowed, and before the wheat was drilled in as aforesaid; that the wheat sown on said field was the Indiana select white, and that 1½ bushels were sown to the acre on said field; that said wheat was harvested about the 10th day of July, 1864; and that he caused to be surveyed from one corner of said wheat field above described, two and sixty-nine one hundredths acres, and had the wheat harvested on said tract of 2 69-100 acres kept separate from the balance of the wheat grown on said field, and had the same threshed and measured carefully and exactly, and that the amount and aggregate threshed from said tract was 109 32-100 bushels; and that the average number of bushels per acre, of said 2 69-100 acres as aforesaid, was 40 bushels, 2 pecks and 3 quarts.

JOHN MILLER.

Sworn to and subscribed by the said John Miller, this 24th day of September, 1864.

W. W. CLARK, J. P.

Also at the same time and place, personally appeared John A. Shoemaker and Lewis Good, who being duly sworn, say: That they were present and assisted in the cutting, gathering in, threshing and measuring of the wheat grown on the said tract of 2 69-100 acres, as set forth in the affidavit of John Miller, hereto attached, and know from their own personal knowledge, that there were 109 32-100 bushels harvested and threshed from said tract of land; that the same was carefully measured and kept separate and distinct from the balance of the wheat grown on other land of said John Miller.

J. A. SHOEMAKER,
LEWIS GOOD.

Sworn to and subscribed before me, this 24th day of September, 1864.

W. W. CLARK, J.P.

Also at same time and place, personally appeared J. P. Floom, resident of said county, who being duly sworn, says: That he is a surveyor by profession; that he was called on by John Miller, of Stark county, to make a survey for him; and that on the 24th day of September, 1864, he surveyed, from the southwest corner of a stubble field of wheat on said Miller's farm in Perry township, a field measuring two acres and sixty-nine one hundredths of an acre; and that said tract contains no more land, as he verily believes, and as he is led to believe from actual survey.

J. P. FLOOM.

Sworn to and subscribed in my presence, this 24th day of September, 1864.

W. W. CLARK, J. P.

Also at same time and place, the said John Miller made oath as follows:

That he planted in the spring of 1864, a piece of corn on his aforesaid farm, containing two acres; that the soil is of the same description as that described in said Miller's affidavit, hereto attached; that said lot was plowed but once, and just before planting, and about 8 or 9 inches deep; that the rows were planted about 3 feet apart each way, and the stalks would average about three to a hill; that it was cultivated by once harrowing, one way, and three times plowed with a double shovel plow; that said ground was not measured; that he put on said tract about 75 pounds of plaster to an acre; that said plaster was put on said corn soon after the corn came up; and that the corn planted is called the Hackberry.

JOHN MILLER.

Sworn to and subscribed before me, this 24th day of September, 1864.

W. W. CLARK, J. P.

Also at same time, appeared J. P. Floom, who being duly sworn, says: That he understands surveying; that he surveyed, on the 24th day of September, 1864, for John Miller, on his farm in Perry township, a piece of corn land, containing two acres; that the same is now planted in corn; and that said tract by him thus surveyed, contains no more than two acres.

J. P. FLOOM.

Sworn to and subscribed in my presence, this 24th day of September, 1864.

W. W. CLARK, J. P.

Also appeared, October 29th, 1864, the said John Shoemaker and Lewis Good, who being duly sworn, depose as follows:

That they were present when the within described two acres of corn were husked, and were present when the same was measured, and that they measured the same, and, of their own personal knowledge, know that there were husked from said two acres of corn ground, two hundred and eighty-one (281) bushels of ears.

JOHN A. SHOEMAKER,
LEWIS GOOD.

Sworn to and signed in my presence, this 29th day of October, 1864.

W. W. CLARK, J. P.

One acre of Corn Fodder raised
the summer of 1864.

The land is upland; was seeded to clover in 1863. The clover was frozen out badly, and hence was plowed once, harrowed and rolled for this crop on the 25th day of June. Amount of corn, sown broadcast, 2½ bushels; from one-fourth to one-half was picked up by birds. After being sown, the ground was again harrowed and rolled.

The expense is about as follows:

	Plowing	$2 00
	Corn, 2½ bush., $1.10	2 75
Sept. 28th.	Harvesting, 6 days' work, $1.50	9 00
		$13 75
	5 Tons, at $15 per ton	75 00
	Balance	$61 25

H. K. Smith.

The undersigned, having measured the above described field of corn fodder, find it to contain one acre. We assisted in harvesting it, and, from a long experience in raising this kind of a crop, believe that, when it is fully cured, it will weigh fully five tons.

Henry L. Rowley,
Geo. B. Loomis.

Wooster, O., Sept. 30, 1864.

State of Ohio, Wayne County, ss.

Personally appeared before me the above named Henry L. Rowley and Geo. B. Loomis, who being duly sworn, do say, that the above statement signed by them is true, to the best of their knowledge and belief.

Eugene Pardee,
Assistant Assessor, 14th Dist., Ohio.

Wooster, Sept. 30, 1864.

THE ITALIAN HONEY-BEE;

OR THE

CULTURE AND ITALIANIZATION OF THE NATIVE OR BLACK HONEY-BEE.

BY RICHARD COLVIN, BALTIMORE, MARYLAND.

The first attempt to import the Italian honey-bee into the United States, it is believed, was made about the year 1855, by Messrs. Samuel Wagner and Edward Jessop, of York, Pennsylvania; but, in consequence of inadequate provision for their safety on so long a voyage, they perished before their arrival.

In the winter of 1858–'59 another attempt was made by Mr. Wagner, Rev. L. L. Langstroth, and myself. The order was placed in the hands of the surgeon of the steamer, (to whose charge the bees were to have been committed on the return voyage,) with instructions to transmit it to Mr. Dzierzon on reaching Liverpool; but, in consequence of his determining to leave the ship to engage in other service on his arrival at Bremen, it was not done, and this effort failed. Subsequently arrangements were made by which, in the latter part of that year, we received seven living queens. At the same time, and on board the same steamer, Mr. P. J. Mahan, of Philadelphia, brought one or more queens, which were supposed to be of doubtful purity. Only two or three young queens were reared by us during that fall and winter, and in the following spring we found all our imported stock had perished.

In conjunction with Mr. Wagner I determined to make another trial, and another order was immediately despatched. The queens, however, did not arrive until the following June. Meantime, about the month of May, Mr. S. B. Parsons, of Flushing, Long Island, received an importation of them from the northern part of Italy, some of the progeny of which he placed in the hands of the Rev. L. L. Langstroth, Mr. W. W. Carey, Mr. M. Quimby, and other skillful apiarians, who, with Mr. C. W. Rose, a subsequent importer, and perhaps some others, have bred and disseminated them pretty widely through our country.

In consequence of a severe attack of illness in the latter part of the summer of 1860 I was unable to accomplish much beyond the rearing of some fifteen or twenty queens, which were impregnated by native drones. Aware that European breeders had found difficulty in breeding them pure, and learning that similar difficulties seemed to be encountered by those breeding them in this country, I determined, before disposing of any queens, to Italianize my entire apiary from the purest stock to be procured, and accordingly made subsequent importations from the most reliable sources, including the vicinity of Lake Como. None, however, excelled, if equaled, those procured from Mr. Dzierzon, from whose stock my present Italian apiary has been bred.

As the natural history and cultivation of this race of bees does not, in general, materially vary from that of our native bee, (and a detailed account of it would be too lengthy for this article, and has already been published in the excellent work of Rev. L. L. Langstroth, entitled "Langstroth on the Honey-Bee,") I shall state simply such leading facts of their general history as may seem necessary for a clear understanding of the particular subjects upon which it is proposed to treat.

A colony or hive of bees in its normal condition, during the honey season, contains three kinds of bees, viz: "The queen," "workers," and "drones." In addition to these, under certain other conditions, there sometimes exists another kind called "fertile workers," of which I shall speak hereafter.

The queen is the only fully developed female in the hive. She is impregnated but once, copulating with the drone on the wing, and high up in the air, which, if delayed beyond three weeks after she is hatched, results in barrenness, as she then will produce drone eggs only. She is capable of laying two thousand or more eggs in twenty-four hours. She has a sting, but uses it only in deadly conflict with another queen. She lives to the age of four or five years. When she begins to show evidence of decrepitude her "workers" rear another to take her place, and both are tolerated and protected by the workers in the hive until the young queen becomes fecundated and capable of filling the duties of her ancestor.

The drones are the male bees. They have no sting, are not provided with the means suitable for gathering honey or secreting wax, and except that by the heat of their bodies they aid in rearing brood, they appear to have no duties to perform except the impregnation of the queen, which instantly causes the death of the copulating drone. Their numbers depend greatly upon the quantity of "drone comb," (which is composed of larger cells than the "worker comb,") which is contained in the hive. They have no sting, and unless the colony is queenless, are destroyed by the workers as soon as the honey harvest has passed and swarming ceased.

The workers are females, whose ovaries are so imperfectly developed as to incapacitate them for laying eggs. They gather the honey, build the combs, hatch and nurse the young, raise queens, and perform generally the laborious duties of the hive. They are seldom able to sting more than once, as the sting remains fastened by its barbs in the wound, and being, with its poison-sack, drawn from the abdomen of the bee, soon causes its death.

By puffing smoke into their hives, or keeping them in a state of great alarm for twenty or thirty minutes, they will gorge themselves with honey and become perfectly good-natured and harmless, unless squeezed or hurt; and may then be handled with perfect impunity. During the honey harvest, when their labors are constant and heavy, they often die within three or four months; but those bred later in the summer and fall, when the honey season is passed, and whose labors are light, survive until the following May or June. Usually the queen will lay only as many eggs at a time as her colony of workers are capable of hatching and feeding. Should she exceed this number, however, the workers have a convenient method of correcting her mistake by eating the excess. The eggs are hatched by the animal heat of the mature bees, the workers of which also feed and nurse them until mature—the queens requiring sixteen, the workers twenty-one, and drones twenty-four days, for their full development, counting from the time the egg is laid. A low degree of temperature in the hive may lengthen these periods a day or two, and a very high temperature, on the contrary, may shorten it a day.

Few, if any, bees are bred in the latitude of the northern and middle States between the first day of November and the following February, during which many, having reached their appointed time, die, while others perish from exposure to cold and other causes; thus often reducing their numbers one-half between the first and last periods, at which time the queen again resumes her laying, and continues it, to a greater or less extent, until the following October or November.

As soon as the hive becomes densely populated, if the honey pasturage is bountiful in its supplies, the workers rear a young queen or queens, at the maturity of the first of which the old queen leaves the hive, followed by a portion of the workers of all ages above two weeks, and "swarms;" but "swarming," (not desertion of the hives,) seldom if ever takes place except under the following conditions: a populous colony, a mature young queen, almost if not quite ready to emerge from her cell, a bountiful supply of honey pasturage, and clear weather.

As the workers frequently commence the rearing of a dozen or more queens when they prepare for swarming, which queens mature at different periods, or on different days, they are often led to swarm to excess, by which the old stock, as well as the later swarms, are rendered worthless. When the first or old queen takes out the first swarm, she leaves behind her a young queen, which, under the most favorable circumstances, seldom commences to lay until at least the eighth day after the old one has left. Meantime a large number of young bees, and another queen may be hatched; and before the first-hatched queen has laid any eggs, she may carry off the second swarm; and so also the third, and sometimes, though rarely in this section of the country, a fourth; by which time (no eggs having been laid in the interim,) *all* the brood is hatched, and nearly all has been "swarmed out," the last one, or, perhaps, the last two swarms, being so small, and *so late* in the season as to be unable to build comb, and lay up sufficient stores for their winter support, and the parent hive with an inadequate number of bees to either protect its combs from moth or produce a sufficient stock of bees or honey for their sustenance the following winter. This presents one extreme. The opposite is where (although the colony is populous,) no swarming takes place, and the bees seem to hang listlessly around a hive filled with honey. This may, and often does, occur in consequence of an excess of honey in the hive in the spring, which prevents the rearing of large numbers of bees at one brood. They gradually, perhaps, become populous, and, during the same time, by filling the cells with honey as soon as made vacant by the hatching of the young bees, they arrive at a stage in which there is very little room for breeding or further increasing their number, and, having no room in the hive in which to store any surplus honey, listlessly do nothing. This condition is also sometimes produced in consequence of inclement weather setting in, just at the time they are about ready to swarm, and continuing until all the young queens have been destroyed, and a very large number of workers hatched, which, before young queens can again be reared, on the return of fair weather, fill the brood cells, or most of them, with honey as fast as the young bees in them emerge, and thus bring about that "opulent" condition which disinclines them to swarming, as in this condition but few more bees can be bred that season. Such colonies are very apt to enter the winter with a greatly diminished population of old bees, many of which must die before spring, besides those chilled to death between these thick, cold walls of honey.

Such stocks are likely to prove the least productive in the apiary, so long as burdened with the excess of honey, and afterwards, until they have had time and season to recover.

When the combs in such colonies are movable, of course the seasonable exchange of a few empty frames or combs, for those they have filled with honey, will at once enable them to resume breeding, and by the timely provision to populous colonies of suitable surplus honey receptacles, (each having a small piece or pieces of new comb attached by means of melted wax, or otherwise, to the underside of its top, as an inducement to commence,) they will store surplus honey in these receptacles, thereby leaving those in the brood chamber at the disposition of the queen for breeding purposes.

The difficulty of inducing them to work in these surplus honey receptacles is greatly obviated by placing them over the brood chamber, and having no "honey-board" or intervening partition between them and the brood chamber. A successful remedy for preventing the queen from going up into the receptacles to deposit eggs, and the consequent storage of pollen therein by the workers, (thereby injuring the quality and appearance of the surplus honey,) may be found in using movable frames, in sections, or otherwise, made about one and one-half inch in breadth on their tops, and placing between these frames thin perforated partitions, or comb guides. The space thus allowed for the combs, being too thick for one brood comb, and too thin for two, the workers build but one, the cells of which, being too deep for brood cells, present together with the presence of the comb guides, such uninviting quarters for her royal ladyship that, in the storage of over a ton of honey in such receptacles, I have not had a single instance of egg-laying in them when thus arranged. The frames or sections, may be made of such size as to contain any desired quantity of honey within their capacity. If several sections are used in one frame they should be made to fit exactly, and without grooves, so that they may be easily and quickly removed by a little pressure. As queens seem to possess an inveterate hatred toward each other, and seldom both separate alive when they meet, the workers are compelled to guard the cells of the young queens during the time they are being reared, against the attacks of the old queen; and I have often seen her driven hastily away when she attempted to approach them. Under these circumstances it would seem most unnatural that she should deposit an egg in a queen cell; and although several distinguished European apiarians take the opposite view, and assert it as impracticable for the workers to take an egg or young grub from a worker cell and transfer it to a queen cell, I have witnessed so many instances of their having done so that there can no longer be any doubt upon this point. One of my imported Italian queens this summer gave some evidences of infirmity; and although the colony was not in a condition to swarm, at least eight or ten young queens have been, at different periods during the season, reared by the workers in her hive. One of these queen cells was constructed upon the outside combs, which *were filled with honey*, and where no other eggs were, or had been laid during the season; and where the queen would not be likely to go, or to find the cell. The same precaution, but in a less striking degree, was exercised by them with two others of the queen cells. On two occasions I found the young queens hatched, and one of them had evidently been "out" at least three or four days, and both the old and young queens were being treated with the kindness and attention with which queens are usually treated by the workers. Late in the month of August the queen deposited some three hundred drone eggs in drone cells, at a period when colonies with younger queens were destroying them, indicating clearly their preparations to meet the contingency of her early and final exit. The carrying of eggs and grub from one cell to another is an important fact to be noticed in the rearing of Italian queens, of which I shall hereafter speak.

During the time a colony is deprived of its queen, the workers will build none but drone or store combs, until they are again possessed of one, and they not unfrequently build a large excess of drone combs in the brood chamber of their hives when possessed of a queen, which, as she never deposits any but drone eggs in them, is productive of the most injurious effects, so long as it is allowed to remain there. In the early part of the season, or until about the first or middle of April, queens will seldom deposit drone eggs; but as soon as their pasturage begins to yield a bountiful supply of honey, they commence laying them, and then lay eggs in each and every consecutive comb and cell, (whether drone or worker,) within the compass that their workers can keep warm, or hatch, and continue to do so until the honey pasturage begins to decline, (which is here generally about the first of July) when they will again discard the drone egg-laying. Meantime, however, if there has been a great excess of drones in the brood chamber, the drone progeny, (being only consumers,) often upon their exit, leave too little honey to sustain the colony the following winter. If the space occupied by these drone combs had been occupied by worker combs, there would have been producers reared instead of consumers, which would, of course, have greatly increased the quantity of its product, and saved it from the danger of starvation. There are very few hives which do not contain a greater or less *excess* of this kind of comb, by which the quantity of surplus honey which might be produced in our country is greatly lessened. Control of the combs, of course, enables the bee keeper to remedy this evil.

For various important reasons *colonies should at all times be kept populous.* It is only by the *united heat of large numbers* of bees, clustering closely together in their hive, that they are enabled, without extra care, to withstand the rigors of the winters in our middle, western, and northern States. Hives made of thick boards possess but little, if any, advantage for their protection. As an experiment on this point I had two hives constructed of pine lumber, the boards of one, only one-eighth of an inch in thickness, and those of the other, one-fourth of an inch thick. They were Langstroth's movable comb hives, battened at the corners to give sufficient strength and retain their shape. A populous colony, sufficiently provisioned, was placed in each last fall. They stood in the open air without any shelter whatever, (except their hive) and on examining them in the spring they were in as good, if not better, condition than similar colonies, in similar hives, made of boards an inch thick, and placed on the same bench with like exposure. During the three intensely cold days in the month of January, six less populous colonies, in hives made of thick lumber, perished from the cold, which was very severe. The advantage of populous colonies in this respect is obvious; nor does it stop here; where colonies are populous during winter, they not only consume proportionately less honey, but *commence breeding much earlier in the spring* rearing *larger numbers at each brood*, and *filling their hive with bees by the time the honey-producing flowers bloom:* they also throw off large swarms early in the season, which, having nearly the entire honey harvest *before* them, are enabled frequently, not only to lay up an abundance for their own support the following winter, but furnish their owner with a liberal surplus, while the parent stock has also ample time and opportunity, before the end of the honey harvest, to lay up large stores of honey. Colonies kept constantly populous bid defiance to the bee-moth, as well as other enemies, require far less care and attention from their owner, and from *them alone* are his *profits* realized. To secure in perpetuity this desirable object, the bee-keeper must understand the subject fully, and be able to avail himself of the advantages furnished by the movable comb system of bee-keeping, for without it, he often cannot ascertain the existence of evils in season to remedy them, or remedy them if he did. With it, this is but the work of a few minutes, and possessing full control of their combs he can administer the "ounce of preventive" in a most admirable manner; can increase, diminish, or keep stationary the number of his colonies at will, and provide properly for all their requirements with the least possible trouble and inconvenience. In illustration of this I will answer a question which has been asked me probably more than one hundred times: Why did my bees die last winter—the hive was full of honey? The anxious inquirer has unconsciously answered his own question. "The hive was full of honey," and the bees, compelled to cluster in *thin sheets or layers between thick, cold walls of honey*, which their animal heat being inadequate to warm, they had frozen to death: another late swarm, perhaps standing by its side, had starved to death *in* and *between* EMPTY combs. The simple exchange of a few full, for a few empty combs between these two colonies, would have saved both, and placed them in their *best* condition for breeding in early spring: for it must not be lost sight of that the colony in which the combs are *all filled* with honey, has no room for breeding, while the other would have nothing to feed the young, if bred, until it would be furnished by the flowers, which may not bloom before the following May. Colonies, and particularly weak ones, which are thus retarded in breeding during the early part of the season, cannot become populous until much if not all the honey harvest has passed, and then, failing to secure a sufficient "winter supply," perish of hunger, or desert their hives, and in attempting to enter others are often (by them) stung to death. By simply giving such a weak stock, early in spring, one or two combs of honey, and *nearly matured brood*, from a *populous* colony in exchange for as many *empty* combs; the weak colony can, in a few days, be made so populous as to give full scope to the laying powers of its queen, and become densely populated by the time the honey harvest opens in the spring. The moth, which is generally regarded as the greatest enemy to bee culture, seldom attacks, and never successfully overcomes, a populous colony. In a large majority of cases where they have done so the cause has been the loss of the queen: this loss can seldom be ascertained in other hives, before the work is so far accomplished as to be irrecoverable; while, with the aid of the movable comb hive, it, as well as the intelligent and seasonable application of the *proper* remedy, is but the work of a few minutes: these are but a few of the many vitally important advantages which the Rev. L. L. Langstroth has contributed to the bee culture by the invention of his admirable hive.

DESCRIPTION OF THE ITALIAN BEE.

The Italian honey-bee differs from our native or black bee in color, size, temperament, productiveness, industry, and power of endurance.

THE QUEEN.

The abdomen of the queen is somewhat more lengthy than that of the native queen. The abdominal rings of the Italian queens do not possess like degrees of brilliancy of color. Whether this is the result of accident, or otherwise, I have as yet been unable definitely to determine, but have noticed that the darker colors, (which are few), are more frequently bred in the old dark-colored combs than in new. The bright or standard color of the queens, when first hatched, is of a yellowish or straw color, commencing at the waist and extending nearly to the lower extremity of her abdomen, which is of a dark chestnut brown color, the yellow, as it approaches the three lower abdominal rings, gradually blending into the brown; the lower edges of the four uppermost yellow abdominal rings, sometimes having a very narrow bordering of darker shade than the balance. When first hatched they are long and slender, but in the course of four or five days the abdomen contracts in length, and frequently presents a rusty brownish appearance until two or three days after impregnation, when the abdomen becomes gradually elongated and somewhat distended, and assumes a somewhat darker shade of its original bright color. Subsequent years of age, slightly increase the dark shade of coloring. When she ceases laying in the fall or winter, her abdomen again contracts its length, resembling somewhat its size and shape prior to impregnation.

THE DRONES

Vary much more in color. On some the only perceptible difference between them and the native drone is a slightly lighter shade in the narrow border on the lower edges of their abdominal rings. While the upper half of the abdomen of others, will be entirely of a rich yellow, or orange color; others are spotted, and a few I have seen which were almost entirely of a whitish yellow, interspersed with spots of a brownish color. In shape and size they resemble our native drone.

"THE WORKER."

The abdomen of the Italian worker bee is somewhat longer than that of the native; this is more perceptible when it is gorged with honey, or returning to its hive heavily laden with honey. The lower extremity of the abdomen is also more slenderly pointed, which, together with its rich coloring, gives it a more graceful and elegant appearance. The first three abdominal rings, (including the one joined to the waist), are of a beautiful yellow or straw color: the second and third, and sometimes the first, of these rings or bands, are edged with a narrow border of dark brown, or black. The first does not always extend entirely across on the back of the bee, and is very slender; each succeeding one slightly increasing in breadth. Queens which breed *any* workers with a less number of yellow abdominal rings than three, are assuredly not pure. Where they have the full number of yellowish bands, and those bands are of a smoky cast and black, bordering unusually wide, it is, at least, an indication of doubtful purity. It not unfrequently occurs that queens three-fourths pure, breed workers, all or nearly all, thus marked. The *temperament* of the pure Italian bee is *exceedingly gentle.* They not only rarely offer to sting, but seldom manifest any anger. Though their hives be opened from day to day the whole season through, the same docility is manifested by *pure* colonies as when disturbed only a few times during the season, so that it is unquestionably an *inherent characteristic:* when they do sting, however, it is done with the greatest imaginable determination and force. Any amalgamation between the Italian and native bee destroys their docility, and an equal-bred hybrid, or lower grade of cross between them, is often terrifically ferocious and intractable, when greatly aggravated. I have been stung by them with such ferocity that the stinging bee expired in the very act, its abdomen curling up as if itself stung. I can account for this only upon the supposition that, in consequence of the violence of its anger, or of the exercise of its force in stinging, its poison-sack is ruptured within it, producing instant death, as its contortion is precisely similar to that which follows when it has been stung by another bee, which produces certain, but *not* always *instant* death. Nothing arouses the anger of bees quicker or to a greater degree than the *smell of this poison.* Hence, when stung, the sting should be immediately extracted from the wound, and all the odor of poison destroyed by washing, or otherwise.

The native honey-bee cannot resist partaking of honey or liquid sweets when offered to it, and will gorge itself with them in a few minutes, no matter how angry it may have been at the time of their presentation. Not so with the greatly enraged hybrid, intent upon vengeance; it pays no regard to them, though offered a dozen times; nor will smoke itself always prove efficacious in subduing it under such circumstances, unless it be confined to its hive and the smoke forced in to such a degree of density, as to endanger their lives from suffocation. Kept in this condition for half an hour they will be found somewhat subdued: often, however, a few minutes' breathing of fresh air, restores their former vindictiveness, and they resume its manifestation with renewed vigor; and, though gorged with honey, it does not seem to abate it a particle. Once thoroughly enraged, these degenerates seem to remember it the entire season. In fact, I had one colony which resumed their "sharp practice" in the spring of the following season. There is, however, a great difference in the temperament of different colonies of the impure race, some of the higher Italian grades manifesting much of the gentleness of the pure race. The physical strength and courage of the Italian bee, is greater than that of the native, which it speedily overcomes in either single combat or battle array. A colony of native bees, once attacked by an Italian colony of nearly equal numbers, cannot successfully resist them, and soon becomes its prey, unless timely succor be extended to it. They are by no means conscientious on this point. As soon as they can no longer procure honey from the flowers, they may be found lurking about in search of weak or defenceless colonies, which they soon destroy if permitted: still, however, so long as the honey harvest abounds, they seem not to think of robbing. May we not therefore attribute it to their *excessive industry?* for in this they also excel, working both later in the evening and earlier in the morning, as well as much later in the season, than the native bee. Our honey harvest usually, in this section of country, terminates about the middle of July. Last year I found them building combs and storing surplus honey during a great part of August and September. They doubtless obtained it from some source unfrequented by the native bee, as the latter were at that time consuming the honey they had previously gathered. As queens continue to lay in the summer and fall, so long as their workers continue to obtain supplies of honey from abroad, they of course breed later in the season than the native bee, which is of vastly great advantage in sections of country where they are compelled by cold to lie dormant so great a part of the year. As they seldom swarm late in the season, the bees bred at this period enable the colony to enter the winter with a *large* population of *young* bees, the larger portion of which survive until one or two numerous broods have been hatched in the following spring, and the colony prepared in numbers to swarm, as well as in every other respect to avail themselves of all the benefits of the honey harvest, the moment it presents itself. To this fact, and their great powers of endurance, I attribute much of their productiveness. There is, however, one other most striking feature which, doubtless, is greatly contributive to it, viz., the rapidity of their breeding. As soon as the weather becomes sufficiently warm in the spring to prevent the chilling of their more hardy brood, if you will open the hive and examine their combs, you will find entire sheets of it filled with young in process of maturation, all attended by a few scattering bees, presenting almost the appearance of a deserted colony. This enables them to far outstrip native colonies of like size, in building up a strong population *early in the season*, which is vital to their prosperity; for, if the bees are hatched and ready to enter upon their work as soon as the harvest presents itself, all that *can* be done may be and will; but, (as is the case, probably, in six-tenths of all stocks of native bees), if not hatched until the harvest is one-half or more passed, of course much is lost; and when we consider that, in the greater part of the country lying north of Mason and Dixon's line, the honey harvest lasts only about two months, during portions of which the bees are kept in their hives and their pasturage rendered barren by rains, it will be seen that a few days of *favorable* weather is, to them, an item of no inconsiderable importance. I have had, in a period of *two weeks*, at the height of the honey harvest, nearly *thirty-five pounds* of honey stored in surplus honey receptacles, besides building the combs in which they stored it, which, as they consume about twenty pounds of honey in secreting the wax used in constructing one pound of combs, would be equivalent to about seventy pounds of honey gathered by a single colony in two weeks. The great redeeming point in the character of the hybrids is that they possess much of the fertility, industry, and productiveness of the pure race. Their stinging propensities, however, in connection with the fact that they are likely to degenerate rapidly and return to the habits of the natives, will prevent their becoming favorites, aside from other objections which will be found hereinafter.

BREEDING.

It is indispensable, or at least of the utmost importance, that those who attempt to breed the Italian bee purely, should familiarize themselves with the appearance and character of the pure race in order to detect degeneracy before it has reached a point at which it may cost them much trouble and care to remedy it. Of course, the *nearer* pure the *impure* becomes, the more difficult the detection of the impurity; and bees, like animals in this respect, sometimes "take sides" in breeding—so much so, that I have had hybrid stocks which none but an expert could have distinguished by their markings from pure. It has been generally supposed in this country that queens were pure which produced workers the first three abdominal rings below the waist of which were of a yellowish or straw color, with a black edging or border. This test *alone*, however, cannot with safety be depended upon. Queens which are three-fourths or nearer pure, not unfrequently produce workers thus marked: but if queens are bred from the eggs of such tainted queens, they, or their immediate progeny will almost invariably, by their *markings*, discover their impurity. This mode of testing has been adopted by the Rev. Mr. Kleine, and other distinguished European apiarians as the only only one upon which entire reliance can be placed: the trouble, expense, and time required to apply it, however, renders it particularly objectionable to breeders, who are exceedingly anxious that the country should be supplied with queens in the shortest possible time within which they can be produced; regardless of a little impurity, which may cost the purchaser months of care and trouble to eradicate, after he has procured a *pure* queen; hence it is exceedingly desirable, both to breeders and purchasers, that some other means more readily accessible should be furnished. This has already been done, at least approximately; but as yet I have not seen it so clearly described as to enable a novice to readily and fully distinguish it without having previously seen pure Italian bees. This test is their extreme *docility*, *perfect composure*, and *quietness* when being handled, or under circumstances which would greatly excite and irritate the native or hybrid. One of the chief recommendations of this bee, which was heralded to the American people on its introduction, was its extreme docility, even under great provocation, and I frankly confess that five years of their cultivation, coupled with constant series of experiments during that period, has, with me, fully confirmed this repute of their character: and I have been greatly surprised to learn, through the agricultural prints and other sources, that Mr. Quimby and some other skillful apiarians cannot agree with me upon this point. Out of probably six to eight hundred queens that I have reared, not one of reliable purity has failed upon this point. So uniformly and invariably is this the case that I should, without hesitation, condemn as impure any stock, whatever its markings, which did not possess this characteristic, unless by oft-repeated and excessive annoyance their anger had been greatly and repeatedly provoked.

On lifting the combs covered by pure Italian workers out of the hive, scarcely any of them will leave it, nor show any indications of anger or discomposure, beyond a careful watchfulness against the encroachments of robbers and protection to their queen, brood, and honey. Another peculiarity is the great tenacity with which they cling to their combs: in a few instances, where the combs have been filled with honey, I have actually shaken the frames to pieces without being able to dislodge all the bees. Colonies which closely approximate purity possess, in some degree, these peculiarities; hence the necessity for persons who propose to breed these bees, to first familiarize themselves with these peculiarities by visiting an apiary of undoubted purity.

ITALIANIZING AN APIARY.

This is done by rearing queens from the eggs of the pure Italian queen, removing the native queen from her hive, and substituting the Italian in her place and stead.

REARING QUEENS.

This process is greatly facilitated by the use of the movable comb hive: indeed, without its use I should almost despair of success in Italianizing an apiary of even moderate size. There are so many circumstances attending this process, which require frequent examination, and a perfect knowledge of what is transpiring in the hive, that their use is almost if not absolutely indispensable to success. I shall therefore assume it in this article. The same egg which produces the worker bee, and as such is *twenty-one* days in maturing, is, through the agency of nutritious food and other operations of the workers, converted into a queen in *sixteen*. The process of its conversion must be commenced, however, before the egg has reached the end of its sixth day's age, unless, as is sometimes though rarely the case, its hatching and development are retarded. Old bees, or those which have remained in the hive over winter, will seldom rear queens; it is therefore necessary to use those recently hatched for the purpose.

It is not necessary to employ an entire colony of full size; a nucleus of a quart or more of young bees, with three or more combs, will answer the purpose even better, as the time consumed in examinations is thereby lessened, and a great saving effected. They are better protected, and in some respects more controlable, by being placed in a small hive to suit the size of the nucleus; but I have sometimes partitioned off a Langstroth hive into three apartments, and used each apartment for a separate nucleus with tolerable success. The partition, however, should *entirely separate* apartments, and prevent communication between them. As bees which have once flown from the hive will, if removed but a short distance, on flying out again, return to the *same spot* where the hive formerly stood, it is very useful, in extensive breeding, to have two apiaries, or localities for keeping them, a mile or more apart. By this means nuclei may be formed in one, which, on being removed to the other, are unable to find their way back, and therefore adhere to their new locality. Bees which have never flown from their hive do not require this precaution. As but one mature queen is tolerated in each hive, (except in case of preparation for swarming,) and bees, so long as possessed of a queen, will not rear another, all nuclei for rearing queens must be made queenless, and deprived of all combs containing native eggs which have not been laid longer than six days: they should then be furnished with a comb, or piece of comb, containing the eggs of a pure Italian queen, which if not abundant, (the comb containing them,) may be cut into strips three-fourths of an inch in width, by about six inches in length, and this strip inserted into a frame of comb, the strip resting horizontally upon bearings of half an inch at its ends, with an open space cut out between these bearings, and under the strip containing the eggs, an inch in breadth. The bees will generally so distribute the queen's cells along the length, and at the lower edge of the strip of comb containing the eggs, as to admit of their being separated without much loss. The comb containing the eggs should hang between two others, containing a sufficiency of honey and pollen to amply supply their wants: these combs, however, should contain no eggs or grub young enough to be convertible into queens; otherwise the bees may select these native or impure eggs or grub for queens, and rear the pure Italian eggs as *workers only.* This is the more important from the fact that they sometimes transfer eggs and grub from one cell to another, or from a worker to a queen cell: they may therefore take an impure egg or grub, and by placing it in a cell constructed upon the comb containing the pure Italian eggs, lead the breeder to suppose it pure; and should it be nearly so, and produce a progeny not easily distinguishable from the pure race, it may be the means of introducing impurity into the apiary, which (failing soon to discover,) may be so extensively disseminated through it as to require much time, care, labor, and loss to eradicate it.

The dissemination of large numbers of impure queens which has already taken place in this country will be productive of much mischief in this respect. It should never be lost sight of that, although the *drone* progeny of a queen reared from a pure Italian egg, but impregnated by an impure or even native drone, may be pure Italian; (which is now considered by Europeans, as well as many American breeders, as an established fact:) yet that is the *only pure* progeny which a pure virgin queen thus impregnated is capable of producing; and that, should she die, and another queen be reared from her eggs resembling the hybridized mother, without the knowledge of the breeder, though *she* should be impregnated by a *pure* Italian drone, she would produce *no pure* progeny whatever, though it might closely resemble it; and, by the introduction of such a queen into an apiary, incalculable mischief may and generally does follow.

The bees will generally construct upon such a strip of comb from one to ten or twelve queen cells, frequently by enlarging worker cells, and extending them, (thus enlarged,) vertically downward in the space made vacant under the strip. The queen cells vary in length from three-eighths of an inch to one and three-eighths inch, and resemble small teats, much in the shape and form of a small peanut shell. Each cell contains a single queen, and as soon as the first of them is hatched, she proceeds to destroy all the others by tearing open, or inciting the workers to tear open their cells, when she will sting them to death, and the workers drag them out of the hive. As the first maturing queen may be hatched on the *ninth* or *tenth* day after the eggs and grub have been given to the nucleus to rear them from, it becomes necessary, in order to save all but the first hatched from destruction, on the *ninth* day, to provide a similar queenless nucleus or miniature colony for the reception of *each* of the young queens; and to cut out all except one of them, distributing them separately to each nucleus, by cutting an aperature in one of its combs, and fitting the queen cell into it. Great care is required in performing this operation, in order to prevent the young queen from being injured or destroyed. Some of them will at that time be found to have just changed into its pupæ or chrysalis stage of development, when they are so tender that a slight pressure, jar, or too long exposure to the cool air, may destroy their vitality. Where these queen cells are distributed to colonies which have but recently been deprived of their queens, and still have eggs or grub young enough to be convertible into queens, they not unfrequently destroy the transferred one, even to the third and fourth trial; and in some instances I have had them to continue it when they had no longer any material for young queens left. In such cases they will sometimes receive a hatched or mature queen; but in others they pertinaciously refuse to receive any, but in that case will occasionally rear one or more from eggs which may be furnished them immediately after those which they had, have from age ceased to be convertible into queens. In a few instances, however, they will, for a time, refuse to receive or rear all and any queens: when this is the case, it is best to break it up and unite the nucleus to another. These obstinate and contrary nuclei are apt to become infested with "*fertile workers*," which, while they resemble the ordinary worker bee, are capable of laying eggs which produce *drones only*. In rearing queens, the workers not unfrequently, after feeding a number of the worker larvæ for two or three days upon the royal jelly, (upon which embryo queens are fed as if intending to convert them into queens,) suddenly cease to supply a portion of them with it, and thenceforward supply that portion with such food only as is used in the development of the ordinary worker bee, completing their development as such.

It has been supposed by Huber, and other distinguished apiarians, that the royal food which they for a time enjoy, produces the development requisite to enable them to perform this queenly function. They are often very prolific, laying thousands of eggs in drone and worker cells indiscriminately, sometimes depositing a dozen or more in a single cell. They are generally bred more abundantly at the season when colonies containing fertile queens have destroyed their drones, and where they happen to be impure, or not of full Italian blood are often productive of great annoyance and mischief in Italianizing an apiary, as their progeny sometimes far outnumber the pure Italian drones then living, and the young queens, matured during their existence, are likely to be impregnated by them. They are the more obnoxious from the fact that, where their progeny is nearly pure, the mischief they create may not be discovered in the first generation, and its consequences may become so widely spread in the apiary as to require great watchfulness and careful pruning, for a considerable time, to eradicate it. Inasmuch as these fertile workers can seldom be distinguished by their appearance from the ordinary worker, and are rarely to be caught in the act of laying, it is next to impossible to discover and remove them; but by furnishing the nucleus with a fertile queen, or uniting it to a colony which has such an one, the laying generally ceases. Whether or not they are then destroyed I have not yet been able to discover. But to return to our young queens. Occasionally some of those which are not destroyed, and come to maturity, are found to be defective, generally, in the wings, sometimes having only one, or none at all. As queens copulate with the drones *only on the wing* and in the air, all such defective queens are of course worthless, except as "drone-layers," and, unless wanted *as such*, should at once be removed, and their places supplied by other sealed queens, or eggs, for the purpose of rearing them. The young queens, which mature perfect if favored with warm and fair weather, (when drones are abundant,) generally leave their hives to copulate with the drone on the *seventh day* after they are hatched, and on the following day, (if impregnated,) they commence laying.

From the period of hatching to that of impregnation, which, in favorable weather, is generally from seven to fourteen days, many young queens are lost, or perish from various causes, a few of which it may be well to enumerate. They may be caught by the bee martin; become exhausted, fall to the ground, become chilled, or, from exhaustion, be unable again to rise; their wings being short, sometimes when she flies out the workers follow her, as in swarming, and all desert their home together; at others they attempt to enter another hive, and are stung to death by its inmates. Occasionally, when all return to their own domicile, the workers, as if displeased with the procedure, seize their queen, and, forming themselves into a knot, squeeze her to death. I am by no means confident that this affectionate embrace springs from maternal affection; still they might sting her to death in a moment, while I have known them to be engaged in this hugging process for three successive days together, and the queen still living, while in other cases they will continue to hug her carcass for several hours after life has become extinct. As soon as they discover her decease they drag her to the entrance and cast her out of the hive.

After impregnation has taken place, and she has safely returned to her hive, losses are comparatively few, unless the nucleus hive or colony be er prolific demands, when she will disencumber herself of eggs by depositing them on the edges, or in large numbers in the cells, and then desert and seek a wider field for her operations, by entering or attempting to enter, another hive, in which effort she generally perishes. At other times, in such small nucleus hives, the population becomes too dense for comfort, and they "swarm." Usually, however, in such cases, as in starving, it is rather a desertion than swarming, as no queen cells or workers remain behind. I have found it very convenient and safe to use a small hive made on the Langstroth movable comb principle, large enough to accommodate three or four combs of full size. When they become too densely populated I divide them; in others rob them of brood before hatched, in order to prevent it. Where they chance to become too weak, I furnish them brood from other hives; so also with honey, thus keeping them in proper condition for my purposes. Where persons are Italianizing their own apiaries *only*, and would have no further use for small or nucleus hives afterward, they may either partition off a "Langstroth" hive into three apartments, as before mentioned, using each apartment for a single nucleus; or, consenting to encounter the loss in honey and brood, consequent upon the colony's being queenless for a time, and the trouble of search in using their entire colonies, they may abstract the native queens, and introduce the Italian queen in a *sealed state*, taking care that she passes safely through all the subsequent casualties to which she may be exposed.

The advantage of this method is that the risk of *safe introduction* into full colonies is encountered, *before much time has been expended upon them;* and if lost, her loss is comparatively small, though at the height of the breeding and honey seasons, it is not so insignificant to the colony's prosperity.

In all cases where the young queens become impregnated by the native, or the impure Italian drones, they should be supplanted by others as speedily as possible, reared from Italian eggs of unquestionable purity; and this precautionary process should be repeated until every colony in the apiary is supplied with a queen of undoubted purity. A most singular peculiarity of some of the young Italian queens is, that during the first few days after their impregnation takes place, they lay none but drone eggs; often depositing them in "worker" cells: a blunder which she never after unconsciously commits until she reaches advanced age.

The power of laying either kind of eggs seems to be entirely under the control of her own volition. Where a hive is deprived of all its drone combs, and entirely *filled* with worker combs, if the season for swarming has arrived, and her colony has become populous, as a last resort in preparing for the impregnation of her successor, she will lay *drone eggs in worker cells*. The workers will also in such an emergency, sometimes by enlarging a few worker cells, convert them into drone cells. The worker cell is only one-fifth of an inch in diameter, while that of the drone is one-fourth of an inch. Repeated examinations have failed to discover any difference between the respective sizes of the comb cells of the Italian bee, and those of the native, beyond the variation to be found in different combs of our native bee.

INTRODUCING QUEENS.

The worker bees manifest great affection for their queen: I have more than once been stung by them, when, catching or holding her, she would utter a cry of distress. When deprived of her they manifest the greatest sorrow and anxiety for her recovery, yet, on hastily returning her *an hour or more* after, I have seen them, in some cases, instantly sting her to death. The cause of this singular and most unnatural treatment was for some time a mystery; but after repeated experiments, I became convinced that it was owing greatly to the manner of presensation, and the temper of the recipients when she was presented. Subsequent experiments have confirmed this opinion. The worker bee is exceedingly watchful and impulsive: the slightest quick motion arouses and excites it for an attack, and if, when in this condition, one of its own sister workers alights suddenly near it, she is liable to be seized, and I have sometimes seen her stung to death before the mistake was discovered. Once excited to combat, they seem completely abandoned to the destruction of the object of their attack; and although they quickly recognize the scent of a queen, yet, under the impulse of angry excitement, they do not often stop short of her destruction. The knowledge of these facts has led to the adoption of various expedients for the safe introduction of queens. As these processes may be most safely and conveniently accomplished with the use of the movable frame hive invented by the Rev. L. L. Langstroth (by which I have been greatly aided), I shall, in explaining them, assume its use.

The first, and probably safest, mode which I shall describe is as follows: In the morning of a pleasant day, when the bees are flying freely, take from one of the most populous hives, four or five combs containing honey and nearly mature brood. Shake from them, into *their own* hive, the old or hatched bees, and hang the combs properly into an empty hive, which should then be carefully closed so as to prevent the escape of the Italian queen, which should then be placed in it by opening one of the holes in the honey-board over where the combs are hung, and dropping her through it on the top of a comb. Then close the hole in the board, and, after removing the before-mentioned populous colony from its stand to another at some distance, place the hive containing the Italian queen on the stand from which the other was removed, and partially open its entrance: the bees which have been out gathering honey, on returning to the accustomed spot, will enter the hive containing the Italian queen. Gorged with honey, exhausted by the fatigue of a long flight, disconcerted by the apparent desertion which has taken place during their absence, and not knowing where to find their original hive, they will at once adopt the new home and queen.

If this operation is performed between the first of May and middle of June, by filling the empty space left in both hives with empty frames, two colonies may be formed of the one; which is one method of performing what is called "artificial swarming." But if it be done *after* this period, and when the scarcity of honey pasturage would render it unwise or unsafe to form a new colony, then, the native queen should at once be abstracted from her colony; and a few hours later, when the workers have discovered their loss and have become dispirited by their unsuccessful search for her, the hive containing the Italian queen should be placed on a level spot of ground near its future stand, with a swarming cloth tacked to and spread on the ground in front of it; then, after smoking or alarming the remaining bees contained in the original hive until they are gorged with honey, they should be shaken from their combs on the swarming cloth. As soon as they have entered the hive (which they will do in a short time), place it on its stand: on their becoming quiet and composed, open the hive and hang into it the remainder of their combs: thus by degrees transferring the entire contents (except the native queen) from one hive to the other.

This process is somewhat tedious, but I have not yet learned of a single instance where it has been unsuccessful, except by the escape of the Italian queen before any of the bees had entered her hive; and this may be prevented by clipping one of her wings. As a colony will never receive a strange queen so long as they possess a fertile one, in all the processes for introducing queens, the first act to be performed, is the abstraction of the incumbent queen, and the apprisal of the workers of their loss by shaking the bees from several of the combs into their hives. This usually so alarms them that they proceed at once to gorge themselves with honey, which renders them so docile and tractable that I have, in a great number of cases, introduced Italian queens, as soon after, as they indicated their consciousness of the loss of their queen (by their moaning noise), by simply taking the Italian queens by their wings, with the thumb and forefinger of my right hand, and *slowly* and *gently* placing them on the top of the combs of the queenless colonies among the workers, ***still holding her fast, however, until the workers indicate their willingness to receive, and treat her kindly***, which they usually do by offering her food, and such other manifestations of favor as they habitually display towards their own queen. This allays all her fears of violence from them, and when relased (which may be done, if kindly treated, within a minute after presentation), she will glide down between the combs with perfect composure, which, in turn, allays all suspicion or excitement among the workers, and relieves her from danger. If, however, on presenting her, she is attacked by the workers, she should, without delay, be withdrawn (without, however, making such a quick or rapid movement as to excite the bees), and the attacking bees instantly crushed. In the course of a few minutes she may again be presented, sometimes with success; but if not, she should be removed as before, and replaced with her own nucleus: in doing which the same precaution should be used as in presenting her to the new colony; otherwise she may perish by the cruelty of her own bees. On the following day, after smoking the queenless colony until all the bees are thoroughly subdued and gorged with honey, the queen may again be presented as before directed: if they still refuse to receive her, it is safer to let them remain for seven days from the time they were deprived of their queen, by which time it will be found they have constructed a greater or less number of queen cells upon their combs, in which embryo queens are being reared: all these should be removed, or the embryo queens destroyed. On the following day, after again smoking as above described, the queen may be again presented as before.

Last year, in introducing probably sixty queens by this process, only three or four failed of success. It, however, requires some skill, judgment, and experience in handling bees.

Another method is to first remove the incumbent queen, and on the following day prepare a small fine-meshed wire box or case (*not* of brass or copper, which are poisonous), about three inches long by one and one-half inch in diameter, with an aperture at one end large enough for the free passage of the queen. In this cage should be placed a small piece of honey-comb containing enough honey for the queen and half a dozen bees for a period of four or five days. The queen, with half a dozen "workers," should then be placed in it, and the entrance of the aperture closed with a thin covering of wax, the cage suspended firmly between two combs, in that part of the hive where most of the bees are clustered, and in such position that the bees in the hive may communicate readily with the queen, and have free access to the wax-closed aperture. They will soon gnaw it open and release her. Several other contrivances have been resorted to, but with limited success. I succeeded, in my early experiments, in making some safe introductions by immersing the queen in honey at the time of presenting her, but found, ultimately, that unless the recipients were in the proper *mood*, at the time of her presentation, they would sometimes kill her.

An incident showing the discrimination of these wonderful little insects occurred in midsummer, some three or four years ago. On searching for an *unimpregnated* queen (then about two weeks old), and failing to find her, I presented the colony with an *impregnated* Italian queen; and, as she glided down between the combs, I observed they did not treat her with that marked kindness which I had expected. The hive was closed, and at the end of about half an hour, on again opening it, I discovered two knots of bees, each containing a queen; and on separating the one containing the unimpregnated queen, I found her lifeless, while the fertile queen, though a stranger, was still retained alive.

PROFITS AND IMPORTANCE OF BEE CULTURE.

The profits of bee culture, like other pursuits in life, depend greatly upon the knowledge of the subject possessed by the bee-keeper and the *proper management* of his bees. The difference in continuance and abundance of pasturage in different localities will of course produce widely different results, but there are very few, if any, localities in the United States habitable by man in which bees *properly managed* will not pay a bountiful compensation for their cultivation, while in the more favorable localities four or five hundred per cent. per annum is no unusual product. In California, and in some of the southern States, where the pasturage continues to abound for the greater part or nearly the whole of the year, the product is often still greater. An average of fifty pounds surplus honey per year from each colony, under proper management, would therefore be a very low estimate.[*]

According to the census of 1860 there are 2,423,895 farmers in the United States and Territories. All these, besides many engaged in other pursuits, might conveniently and profitably engage in bee culture. Allowing an average of only ten colonies to each of these—say two and one half millions of persons—(and it might be 100 colonies each without encountering the danger of overstocking, as there is now a number of apiaries in this country containing over 100 colonies,) and the average annual product of each colony at 50 pounds, the aggregate product would be twelve hundred and fifty millions of pounds, which at 25 cents per pound would amount to upwards of three hundred millions of dollars annually.

According to the census of 1850 there were produced in the United States and Territories in that year 14,853,790 pounds of beeswax and honey, while that of 1860 is 1,357,864 pounds beeswax and 25,028,991 pounds of honey, showing an increase of about 77⅔ per cent.

Prior to the publication by Mr. Langstroth of his excellent work on bee culture, and the introduction of his movable comb system of bee keeping, the pursuit had for some years been gradually, and in some localities rapidly declining, owing greatly to the ravages of the bee moth; inventions of hives *for* the prevention of which were not lacking in either abundance or variety. Many of these, however, instead of preventing it, proved most excellent auxiliaries for the spread of its devastations; while others, perhaps from ignorance of their habits, were so constructed as to prove, sooner or later, certain destruction to any colonies that might be placed in them. Several kinds of these hives had been extensively used throughout a great part of our country, producing destruction wherever introduced, until repeated trials and disappointments had driven beekeepers generally to the conclusion that profitable bee culture had ceased to be practicable in this country, and so discouraged many as to cause them to abandon the pursuit entirely. The expectation that any hive, *of itself* will ever be found to prevent the ravages of the bee moth, is an absurdity, which none but the ignorant or malicious will assert. The *bees* themselves are the only safe and efficient protectors against the moth, and *where properly cultivated* are *fully competent* to the task. Still, until the requisite knowledge of the subject becomes generally disseminated, this prejudice will doubtless continue to a greater or less extent to exist. It is, however, most encouraging to know that already there are a few extensive apiaries in different sections of our country, which, under enlightened cultivation, produce annually an average of from five to fifty dollars' worth of honey and wax to each colony; the quantity varying in consequence of difference in locality and management. These apiaries are, however, comparatively few, and in view of the great importance of this branch of agriculture it is deserving of far more notice and consideration than it has hitherto received. A single half acre of ground furnishes abundant space for the location of an apiary of two hundred colonies, which, (I am sure I speak within bounds in saying,) under proper cultivation, in an average locality, can be made to yield from three to four tons of honey annually, the production of which (unlike that of sugar or any of the cereal crops of our country) is spontaneous, requiring no plowing or toil of man for its production; nor does it, like those, exhaust the fertility of the soil. In fact, it is simply *saving from waste* that which nature provides in most lavish abundance, by bringing into proper use the means provided for its collection and preservation. This subject presses itself the more urgently for favorable consideration at this time, from the fact that one of the principal sources from which our "sweets" have heretofore been obtained has (in consequence of our national difficulties) been almost entirely cut off, while the vicissitudes of war have incapacitated a vast number of persons in the rural districts of our country for pursuing their usual vocations, (though still capable of attending to the manual of bee culture.) It has also left many widows* and orphan children without the means of support, who may, in this pursuit, find at least a competence.

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[*] In the middle and western States it is not uncommon in some localities for single colonies (in apiaries of 100 or more) to produce 100 pounds and sometimes as high as 200 pounds surplus honey in a good season. Query: If any *one* colony in a large apiary produces such a result, why should not all? The pasturage being *equally near* and *abundant to all*, it is obvious that the true reason must be found in the difference of condition or management (or both) of the different colonies.

As this however must depend, in a great measure, upon their skill and management, and as the mass of them at present know but little of the subject, it becomes an object of much importance to establish some means for the general dissemination of the requisite information as speedily as may be. Foremost among these, I should regard the establishment of a periodical devoted exclusively to bee culture. The publication of such a journal was commenced at the beginning of the year 1861, by Mr. Samuel Wagner, of York, Pennsylvania, whose long experience and perfect familiarity with the history and practice of bee culture, both here and in Europe, eminently fitted him for the undertaking. It was continued with marked ability to the close of that year, when in consequence of the general prostration of business, and absorption of public attention by the war, it was thought best to suspend its publication for the time being, and await a more propitious season. Doubtless were its value more extensively known, it would receive such encouragement as would justify the resumption of its publication immediately. While the standard works of "Langstroth on the Honey-Bee," and "Quimby's Mysteries of Bee Keeping," should be read by all, such a journal coming to its subscribers at stated periods, keeping pace with the improvements and discoveries that may be made from time to time, and furnishing practical experiments and results, could not fail to greatly interest and profit the bee-keeper. The adoption of this journal, as premiums of half a dozen or more copies each, by all the agricultural societies in our country, would doubtless furnish the support needed to justify the resumption of its publication, and I am quite confident it would to many prove one of the *most acceptable* premiums that could be offered.

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* Already a number of ladies are extensively and most successfully engaged in bee culture, one of whom I am informed has nearly four thousand pounds of surplus honey, besides a considerable number of swarms, the product of about 100 colonies of bees this year.

Next in importance is the establishment of apiaries in connection with the various State agricultural colleges, now or hereafter to be established in the various States, and the employment of such skillful and *practical* teachers as would be fully competent to impart thorough instruction in this department. Such apiaries have been for several years in successful operation in some parts of Europe, and under judicious management here would not only prove of vast benefit for the purpose of imparting instruction, but might also yield a considerable revenue, or at least prove self-sustaining.

NOTE.—Apiarians generally have limited the possibility of the impregnation of the queen bee to within three weeks from the date of her maturity, and state that it rarely occurs at a later period; but I have in a few instances had them impregnated at later periods; one quite recently on the thirty-fifth day after she emerged from the royal cell; and instances have been cited in which it has occurred at still later periods. In some cases, however, it is only partial, the queen laying worker eggs but a short time, and in limited numbers only.

QUEEN.

WORKER.

DRONE.

LIQUORICE

(Glycyrrhiza glabra.)

BY J. P. KIRTLAND.

The farmer of the Northern and Middle States may not possess as much individual wealth as the planter of the South, yet his circumstances render him far more independent than the latter. The one produces a great variety of articles, the other concentrates his efforts on one or two leading staples. Drouth, excessive rains, frosts, depredating insects, and other unfavorable contingencies are, perhaps, equally liable to occur in any section of the Union. From their impression the Northern farmer occasionally finds, at the close of the season, that many of his articles of produce have been either cut off or abridged in quantity or quality, while others have escaped injury, or perhaps are more abundant than usual. Increased demand and prices for what he has on hand, usually compensates for the loss of other items. At all events, his store will contain, at least, enough money to meet the wants of his household, though his profits should be *minus*. A community made up of such a class ot individuals can never, in this country, be reduced to extreme want. These unfavorable contingencies intervening at the South, may destroy or greatly impair the cotton, tobacco, or sugar crop. The planter must then rely upon his former incomes, or present credit, to supply the demands of his expensive establishment till another year can yield its staples. From this view of the subject, it becomes evident that it is desirable to augment the list of articles which the Northern farmer can successfully produce. Public attention is at this time directed toward that object, and several new articles are undergoing the test of experiment.

The Agricultural Department of the Patent Office has done much toward its attainment, by introducing and gratuitously distributing seeds of *new* vegetables or of a *reliable* character, as well as by the awakening attention, by means of its annual reports. We apprehend that the extent of the benefits thus conferred has not, in all instances, been duly appreciated. The recipients of such seeds should at least feel themselves obliged to give them a faithful, judicious and thorough trial, and to report the results to that department.

We beg to invite the attention of ingenious and observing farmers to the cultivation of the *Liquorice*. This plant may, we think, be added to the above named list. At least it should be set in the list of those *worthy* *of trial.* The Patent Office Report, for the year 1854, contains an interesting article on its cultivation, but speaks of it as a tender plant; and the same idea is reiterated in the Report for 1855.

Our experience with the plant, though somewhat limited, enables us to state that it is at least as hardy as the common milk-weed, *(arclepais syriaca).* In the summer of 1818 we saw it growing luxuriantly in the garden of the late Dr. Jared Foote, in Northford, Connecticut, above the 41st degree and 30 minutes north latitude. The soil was a rich, dry loam, formed from the debris of the *trap* formation of that vicinity. As the plant occupied, at its own option, such parts of the garden as best suited it, no other cultivation was extended to it than was extended to the common esculents among which it grew. It flourished with great vigor. Suckers and offsets frequently extended into adjacent grounds, and even into the public highway, where their appearance was closely watched for by the "*liquorice-toothed*" boys of the neighborhood. Their depredations on its sweet roots were not always confined to the highways, but they occasionally disturbed the garden beds of the good old Doctor. Through his kindness we were furnished with a number of its offsets, which flourished in our grounds in Durham, Conn., during the next four years. The soil was similar to that of Dr. F. What ultimately became of his and my stock, we do not know, having left that vicinity in 1823.

Little doubt is entertained but that the *liquorice* would flourish in the rich, limestone soils about the base of hills, &c., on the bottom lands in the State of Ohio. But the rich, rolling prairies of Illinois and Southern Wisconsin, we should consider as peculiarly adapted to its cultivation. The practical farmer will inquire—"To what market can it be carried, and to what use applied ?" It is now imported into the United States in quantity valued at about $300,000 annually. This amount our farmers might first supply, and if its cultivation should prove successful, the amount might be greatly augmented to meet an increased demand, which would spring up from such a result.

The *Liquorice* is a native of the South of Europe and Asia, but is capable of cultivation in much colder climates. It was well known to the ancients, and is noticed by Discordes and Hippocrates, and was in general use in the time of Pliny. Several species are employed, but the best article is furnished from *G. glabra.* Large quantities, in the forms of the root and the extract, are imported into this country from Spain and the Mediterranean ports. Two hundred tons of the extract are sent every year from Spain, principally to London, where it is extensively used in the brewing of porter. The best and purest articles of London ale, porter and beer, renowned throughout the world, are composed essentially of hops, malt and liquorice, and are exempt from all deleterious drugs. Large quantities of various preparations of beer are now consumed in the United

States, and the amount will no doubt be annually increased, in spite of law and lecture. Under these circumstances, it becomes a question of expediency, whether it would not be better to attempt to reform the quality of the beverage, if we cannot improve the habits of its consumer. The large moiety of the ale, porter and beer now offered the public in the United States are dangerous compounds, containing deleterious poisons, such as strychnine and coculus indicus. If a pure article could be furnished as cheap as these medicated ones, less injury would be occasioned by our lager beer saloons. The production of an abundant supply of the liquorice would do much toward correcting the evil, and, at the same time, would increase proportionately the demand for that root.

We believe, also, that a judicious use of a pure and well prepared article of malt to be, in connection with cod liver oil, one of the most successful agents in correcting a tendency to consumption (tuberculosis) in patients of a scrofulous habit. On this ground, also, we urge the extensive cultivation of the liquorice plant. As an article of medicine, its properties are well understood by physicians, and it enters frequently into their prescriptions. Another encouragement for its cultivation, is the fact that the extract formed from its root, and furnished principally by Spain, is impure, and its saccharine principles often impaired, to a great extent, by charring, in the process of evaporation. Under the ingenious management of our American farmers, a much superior article would be produced. We recollect to have read, within a year or two, an article by Wm. Prince on the subject of the liquorice, but our memory does not enable us to refer to it, or recollect in what journal it appeared.

The following remarks on the management of the liquorice, we copy from the Patent Office Report of 1854, pages 358 and 359:

"This plant is a tender perennial, with roots extending very deep in ground, and creeping to a considerable distance. When full grown, they are as thick as the thumb, round, slender, flexible, and furnished with a few scattered rootlets; of a yellowish color externally, succulent and fibrous within. From the root proceed three or four erect, herbaceous, pale green stems, four feet and upwards in height, garnished by alternate pinnated leaves, having yellowish green leaflets, clammy on their under sides. The flowers are small, papilionaceous, of a bluish or purplish color, and are succeeded by oblong, smooth, compressed, and one-celled leguaries, containing two or three small kidney-shaped seeds.

"The soil should consist of a moist, loose, sandy loam, or the back mold of the alluvial or bottom lands, situated near our southern lakes and streams. In short, the fresher, newer, and richer the ground, the better for the plantation; and if not sufficiently rich, it should be made so by adding a due quantity of rotten stable dung, mixed with plaster or charcoal, and wood ashes or lime, in order to rot it the more, till deprived of its fermentative heat, which would otherwise injure the runners or sets. The ground should be sub-soiled or trenched three or four feet deep, and, if sufficiently rich, throw into three and a half foot beds, including the alleys, in the centres of which the sets are to be planted early in March, at intervals of eighteen inches apart; but if the ground is not sufficiently rich, trenches must be dug throughout the field three and a half feet apart, from centre to centre, wide enough for a man conveniently to work in, and three or four feet deep. When one trench is dug, it must be filled with the earth from the next, well incorporated with the dung or compost, and alleys made seven or eight inches deep, midway between the trenches, the earth being spread over them so as to form raised beds throughout the plantation. In the next place, the runners or sets are to be provided, which consist of three sprouts that proceed from the thick ends of the roots, or crowns of the plants, usually lying about two inches below the surface, and are three or four feet in length. These small running roots are to be cut into five or six inch pieces, with two or three eyes, or joints, to each piece. Another kind of sets consist of the tops, or crown buds, which are cut from the liquorice roots at the time of harvesting. When the sets are in readiness, dibble holes along the centres of the beds, 18 inches apart and 7 or 8 inches deep, into each of which thrust a piece of root, with the small end downward, covering it entirely with mold. If crown buds are used, they may be treated in the same manner, with the exception of dibbling the holes less deeply. During the spring and summer, all weeds must be kept down by the hoe, care being taken not to cut off the top shoots of the plants, as it would greatly injure them. In the autumn, when the stems of the liquorice are in a decaying state, they should be cut down, and a light dressing of rotten dung spread upon the surface. The following spring—say early in March—the ground should be slightly dug between the rows, burying the last dressing of dung, care being observed not to cut or otherwies injure the roots. During the second and third summers, the field must also be kept free from weeds by occasional hoeings.

At the end of three years after planting, the roots will be fit to take up. The proper season for this is from November to February; for they should neither be taken up before the stalks are fully decayed, nor deferred till late in the spring; otherwise they will be apt to shrivel and diminish in weight. Begin by digging at one end of the row and continue on to the other, in order to take up all the roots. When they are collected, the large roots are to be separated from the small side-shoots, which must be trimmed off and divided into proper lengths, and, with the crown buds, preserved for fresh sets. The former may be stored in dry sand in a cellar—first a layer of sets and then a layer of sand. The crown buds will keep if laid in a heap and covered with dry sand. The sooner liquorice is sold, the heavier it weighs; and the greener it is, the more virtue it contains. It is sold in three distinct forms, namely, in the roots, in powder, and in its inspissated juice. The first of these needs no explanation. The second is prepared by cutting the small roots into small pieces, drying them in an oven or kiln, and grinding them in a mill. The third kind is prepared by pounding the small roots and fragments with cold water for nearly two days, after which the pulp is squeezed and the juice boiled down, in an iron pot, to a pitchy consistence, and then rolled or stamped into sticks or cakes, under the name of 'Spanish liquorice.' Liquorice roots will keep a year, if laid in sand and stored in a cool, dry cellar; and if the sets, or runners and buds, are cut ready for planting, tied in bundles and sent by land carriage, they will keep a fortnight. If packed in sand and sent by water, they will keep some three or four months, especially the more hardy buds."

ON THE BREEDING OF HUNTERS AND ROADSTERS.

By **Robert Hutchison** of Carlowrie, Kirkliston.

[Premium—Medium Gold Medal]

The breeding of horses is at all times replete with interest, and forms an important department of agricultural economy, concerning not only those who are personally engaged in its pursuit, but the wider circle of the general public, who make almost daily use of the "noble animal," whether for the purposes of pleasure, commerce, or agriculture; while it has also a claim to be regarded almost as a question of national importance, inasmuch as it contributes to the security of our defences by supplying, in proportion to the attention bestowed upon the improvement of the various breeds, a more or less serviceable and efficient class of animals for those two highly requisite branches of the army—the artillery and cavalry.

Although the breeding of horses for agricultural purposes must naturally command the first place in the mind of the farmer, it does not appear, we think, that sufficient attention is paid (particularly in Scotland) to the improvement of the race of hunters and roadsters; or that the breeding of those two important classes of animals receives that amount of encouragement from local and other agricultural societies which its importance deserves. Doubtless, by the now almost universal introduction and rapid extension of the railway system of communication throughout the length and breadth of our country, the necessity for rearing horses for other than agricultural purposes has in a great measure been diminished; the demand (for commercial purposes) for many of the half-breds and harness horses has disappeared; and, indeed, the keeping of them has been discontinued. The old *coaching-horse* has been distanced by his iron-lunged successor; the fox-hunter, instead of riding to the distant "*meet*," as in olden time, on his stout trotting roadster, now travels by the morning train; and the increased extension of the application of steam power to many agricultural purposes, threatens still further to render the attention due to the maintenance of our national *prestige* for horses of all classes of enduring capability a matter of only secondary moment. Let us hope that such a change in regard to the necessity for horses may not tend to indifference in using means for perpetuating the hitherto unequalled superiority of English breeds, and especially that no further deterioration may accrue to those two classes now under notice; but let us believe that first class animals of these kinds are only now less commonly seen than heretofore, because less generally used.

To preserve and improve any particular breed of animals, due regard must be had to the judicious selection and union of proper and suitable parents for transmitting, and perpetuating in their offspring, those qualities and points which may be most esteemed. In no class of animals is this more apparent than in the two species of horses which form the subject of this paper.

The opinion is much too prevalent, and, we fear, too currently credited, that any mare is good enough to breed from, and in this belief the farmer frequently retains as a brood mare some animal worn out in constitution; or, it may be, defective in many of those important points which should always characterize one destined for that purpose; and absence of which, *in the dam*, is almost certain to predicate similar defects in her progeny. Much of this is equally true as regards *the sire*, especially in the case of hunting-stock, as we shall afterwards show; and while many, therefore, are disappointed in the realization of their hopes in respect to their stock, from that cause alone, another considerable drawback in the way of improving the breed of hunters and roadsters, is the popular opinion regarding the uncertainty which so generally attends the efforts of those engaged in the speculation. Many persons, indeed, even of practical sound sense, look upon the general question of breeding horses as so hazardous an undertaking, and the prospects of success attending it, even under judicious management, as so small, that they are not only themselves deterred from entering into it (although in many instances we know they have otherwise all the inclination and opportunity), but they actually promulgate their views with so much assurance and confidence that others are induced to abandon the idea also, and hence breeding the higher classes of horses has become popularly regarded as a subject of the utmost difficulty, risk, and obscurity,—as, in fact, *a losing speculation*.

To such as hold these views we would say, while we frankly admit that there is much truth in the assertion that uncertainty does prevail to a great extent, and that the difficulty of controlling results or predicting events in breeding may be looked upon as almost insuperable, still very much towards the desired end may be attained, and success and pecuniary remuneration rendered more probable by close and attentive observation of the operations of nature, and by comparing and recording past events; and although we cannot without reservation say that study and a careful comparison of our own experience and labors with those of others under similar circumstances, will lead to infallible rules for fixing and defining certain laws and principles by which breeding may in ordinary cases be guided, still by this practice much may be explained and prevented; and such a system of attentively judging antecedents will always lead to an approach to a more lucid comprehension of the causes which operate in producing certain effects. If this were better and more generally attended to, the subject of breeding would be placed upon a much more certain and satisfactory basis, and breeders themselves following such a custom would receive material aid in their endeavors to improve the race, by the speculation being rendered less hazardous; and it would soon be apparent, beyond any doubt, that *chance* alone (as many suppose) does not preside, nor form the *only* agent in breeding horses.

In the spirit of these remarks we have ourselves been guided during ten years in breeding (and with considerable success) these very species of animals of which we are now treating; and we have invariably found that although investigation into, and comparison with, former events does not *always* lead to the same results in parallel cases, they yet amply repay the trouble of inquiry; and we have always observed that those who study the subject most closely invariably receive the highest rewards in the enterprize.

In breeding hunters and first-class roadsters, we maintain that to produce animals combining the three essential requisites of perfection for the purposes required, and which we enumerate in what we deem their order of value—viz: *action*, *power* (comprehending *endurance*), and *conformation*—one of the parents must be thoroughbred; and we recommend that this purity of breeding be on the paternal side. It is further very important to know exactly the lineage of both parents, and to bring together only such animals as combine within themselves individually as far as possible these qualities:—1st, Action and power, which go to produce speed and endurance, on the side of the descent whence the "blood" is derived; and, 2d, Form and temper, which generally produce a good conformation in conjunction with energy and action, and these qualifications we prefer taking from the maternal side. But it must always be borne in mind that the ancestry of the dam's family must be as good and pure as is consistent with the symptoms of breeding which she in her own figure and appearance generally presents; for, as Earl Spencer has well remarked in regard to breeding, "the influence which each parent exercises on its progeny is in proportion to the purity and antiquity of its family line."

But not only is it necessary that each parent must in his or her own case exhibit such qualifications as we have stated, it is equally requisite to insure the most successful results in regard to their progeny, that their relations *to each other* in conformation, blood, and age shall be assimilative, otherwise a very good sire and a very good dam *per se* will not necessarily produce an equivalently good foal. In fact, the groundwork for the formation of a good horse consists, not so much in the selection of his sire and dam, as in the adaptation of these parents the one to the other; and the more incongruous they happen to be in regard to the three particulars above specified, the less probability is there that their stock will form either hunters or roadsters of the proper stamp, and the greater the chance of the breeder being presented with only a mongrel-looking animal. When we assert that each parent exercises a definite and arbitrary influence in the formation of the offspring, we do not mean that there is a mere blending of all the qualities of the two; but that in the foal are found developed certain good points of structure and temper generally derived from the dam (although in some cases it may be from the sire), and other qualities, including most commonly breeding or "blood," speed, and endurance, from the sire.

As a rule, we may state that the external conformation and other characteristics of the stronger or more vigorous parent at the time of congress, are reproduced in predominance over the similar points of the other parent in the progeny. Colts, we have frequently observed, take after the mare, and fillies after the sire.

In bone and enduring capability we notice that the dam exercises the greater preponderance *in thoroughbred stock;* and hence, should a very highly bred mare (probably seven-eighths parts) be put to a thoroughbred stallion, there is an almost certainty of her foal in these two particulars following his dam. We have never yet, however, seen any horse in every respect the exact counterpart of his sire, or the photographic reproduction of his dam; and we have rarely known young stock combine *all* the good points of both parents; and we therefore insist the more strongly upon a more general attention to the careful selection of a sire in every case suited to the particular requirements of the mare from which it is intended to breed. Inattention to this very material principle in breeding begets a race of narrow-chested, leggy animals, most frequently very defective in their forelegs, and particularly wanting in that style and quality which are so unmistakably evident where a happier union of parents has been observed.

Nor is the transmission of qualities or defects, as the case may be, confined alone to the parents. It goes back even to the grand-sire and grand-dam, or sire of the dam; and many properties or vices, dormant for a generation, are sometimes reproduced in the next. This may be styled "breeding back," and only further confirms the great advantage to be derived from giving due regard to lineage, and carefully excluding from the stud either stallion or mare whose ancestors in any degree, not very remote, are known to have possessed damaging faults; for unfortunately what holds true in regard to the reproduction of good points of character or of form, is equally so as regards vices, although happily not to such an extent, if we may judge from the fact that very frequently cart mares very vicious themselves produce remarkably good-tempered foals. In the higher bred classes, however, it is more common, and precaution should therefore, if possible, be taken to avoid the risk of any vice being developed. Particularly should this exclusive principle be applied to the breeding of hunting stock, for in the nature of every such first-class animal there should always be found the happiest combination of all good properties of form, constitution, and temper,—power and action condensed in compact shapes, (bulk always indicates, to a certain degree, *coarseness*,) and an ever-cheerful temper, and ready energy of will to put all the hereditary physical strength and innate capability, when required, into use.

Having thus dwelt at perhaps greater length than was necessary upon the importance of a careful investigation into the pedigrees of both horse and mare from which it is intended to breed, and also assuming that due regard has been given to the adaptability, so to speak, of the one parent to the other in the various important points specified, we shall now consider the parents separately in detail.

First, *As to the Sire.*—We have invariably found in breeding hunting stock that a short-backed thoroughbred horse put to a half-bred or three-parts-bred mare, of strong, well-built, lengthy frame, and *with good action*, as a rule produces the best stock. In fact, if this cross be followed in ordinary circumstances, and with no more additional caution than is customary, the produce will almost invariably be very satisfactory, and the speculation comparatively safe. The thoroughbred to be chosen as a sire must, in a considerable degree, depend upon the mare he is to be put to; and nothing can be more fallacious than to suppose that one good sire, solely on his own account, should be retained in any large stud.

It is not desirable that there should be any remarkable or unseemly discrepancy either in the age, height, or breeding of the two parents. For example, the offspring from the union of a very old stallion with a strong, healthy young filly will be found to partake too much of the dam in conformation, owing, we may suppose, to the vital principle in her being more vigorous than in her older consort, and *vice versa.* Hence, therefore, unless it be desired to perpetuate such qualities as the stronger parent presents, unaltered in any considerable degree, such a congress is to be avoided. In *height* the difference is of less moment; but we may notice that it is always preferable to have the dam the larger and the taller of the two in every instance. And, as regards *blood*, let the discrepancy between the parents be as immaterial as possible. We have already said so much on this point that we need not repeat any argument against such a practice. The coarseness of the low-bred parent is sure to present itself in some way or other in the stock. They may be well-bred looking animals, and well enough adapted probably for useful purposes, such as harness and light draught-work, and we have seen many good colts of this stamp got by thoroughbred sires from strong "clean-legged" cart mares, but as hunters or roadsters they are useless, and will consume just as much food, if not more, and require as much trouble and attention, as a better and "truer-bred" animal. It is a very objectionable practice, particularly tending to encourage such a style of breeding as this, to serve agricultural or cart mares at a lower service-fee than half-bred or higher-classed mares. Indeed, this custom should rather be reversed. The flaw in the escutcheon of the produce is certain to manifest itself in some way—the sluggish nature and softness of the dam, or her disproportionate amount of offal, is almost sure to be presented. We recollect once having a chestnut filly whose symmetry and proportions were all that one could wish; her style of going, and whole *contour*, were undeniably good, and betokened no mean lineage, were it not that the coarse hair on her legs, and the tufts of her fetlocks and heels, were those of the Suffolk breed—arising, we must confess, from her grand-dam having been a pure mare of that race; and, consequently, her dam, being but once removed from the class, had partaken of, and again imparted, the grand-dam's conformation to a great extent; and thus the unfortunate beauty-spot came to be present (although, of course, to only a modified extent), after going through two generations. Such indications of low origin presenting themselves in many points, and most frequently about the head, neck and mane, can only be avoided by a closer assimilation of the parents, constitutionally and anatomically; and to improve upon any good-shaped mare by imparting to her stock more blood, or upon any favorite thoroughbred sire by obtaining a progeny resembling him, but possessing more bone probably, and less breeding, the progress must be assimilative.

The judicious breeder will receive much aid in forecasting results in regard to the probable "*get*" of any stallion with any mare he wishes to put to him, if he can have an opportunity of seeing his stock and *their* dams. This is always, where it is practicable, highly desirable.

No stallion should be permitted to commence traveling before he is five years of age, to do him and his stock justice. He may, it is true, be allowed a *few* mares when rising *four* years old; but this, we think, is rather objectionable, and contrary to the laws of nature that such an office should devolve upon a horse till he be fully formed, and the ossification of his structure perfected and developed; and it is much more probable that degeneracy in the breeds will follow the use of a stallion undeveloped in his muscles and tendinous fibres and heads of the bones, than in using one in full possession of thoroughly matured powers, and arrived at a full-grown age. Nature in an immature condition is surely no match for nature perfect.

As regards height, we think that fifteen hands and a-half is a very fair average standard. With an inch over or under that mark we should not complain, other points being in proportion. Too tall a male is very objectionable, and has in our experience always proved so, the produce being generally remarkable for incongruous proportions; and although they may be "well topped," they are too frequently leggy and narrow-chested. The stallion should stand on flat-boned short legs, and be entirely free from any "tied-in" contraction at the cannon bone immediately below and behind the fore-knees. His forelegs should be placed well out in front, so that he may cover the ground well, and stand squarely, not carrying his legs under him. His legs should be free from all curbs, splints, spavins, or other such osseous deposits. If he be an aged horse, and have done much running, these flaws will be less discernable than if he were a younger stallion; for having become absorbed by age and work (not fatigue, which in youth rather tends to develop them), they will be less apparent. Notwithstanding this, however, they are equally apt to be transmitted to the progeny, for the blood becomes, through absorption, to a certain degree vitiated, contaminating the whole system; and this ossific diathesis is most certainly hereditary—more so, in fact, than in the case of a stallion younger, and exhibiting a curb or other such weakness in the crude state.

Particular attention should always be paid to the shoulder of the sire. The *upright* shape should always be avoided in breeding hunters; and in selecting a thoroughbred sire, great care is necessary to procure one with good *oblique* shoulders, and sharp on the top, at the mane, and *well laid back*. Deficiency in this too frequently begets a heavy forearm, and gives a tendency to stand with the forelegs drawn in under the belly, and general inferiority of carriage and action, if, indeed, these be present at all.

The hind hocks are another, and very material, point to look to in the choice of a sire. They should be "clean" and well formed, with the thighs immediately above the hocks, muscular and broad-set; for in this, with a good back and well-coupled-up loins, consists the leaping powers, and strength to throw himself over a fence. The feet should be particularly noticed—that the hoofs are free from sand-cracks and malformation; for even if a contraction through injudicious shoeing be there, it is very apt to be perpetuated hereditarily in the young stock. In fact, the hoofs and their formation should be always carefully scrutinized, for no part of the sire's conformation is more usually, if defective, transmitted to his progeny than this. The fetlocks should be springy, not disproportionately long; and, above all things, let the fore pasterns not be short and upright. No horse with such a formation ever "gets away" freely, and is sure to be "hammered up" with the least fatigue. These points, then, seem to us the principle and salient qualities in a sire's conformation. The others, such as the head, which should be small, and flat and level in front of the eyes; and his neck, which ought to be long, and well-arched out at the cheek and throat; his back, which we prefer best to be short between the shoulder-blade and short rib; and his hind-quarters, which should be free from drooping—are but secondary points in comparison with those we have detailed. His temper, and that of his ancestry, should be undeniably good, and docility should characterize himself. As to color and markings, these are matters of taste entirely; some prefer white, others abhor a "blaze" or "white stockings," but "no good horse ever had a bad color."

Let us now consider the dam or brood mare; and, as already mentioned in reference to her, we would remark that far too little attention is paid to her selection. It is a popular opinion (or, at all events, it is a common custom arising from the prevalence of such an opinion), to fancy any mare good enough to breed from; but there is no greater mistake into which many breeders fall than this. We believe that more depends on producing a good foal from the mother than upon the sire. The very frequent custom of breeding from old and worn-out mares (although often *good* in their younger days) is highly reprehensible. Such animals seldom, if ever, produce stock of great value; and should it be wished to breed from any mare whose frame may be worn down by hard work or running, it is an excellent plan to allow her first a year's grass or "summering," to enable the constitution to become again "set up." Such a respite is well repaid in the future progeny; for after the nervous system has once become excited, the vital principle becomes disarranged, and an excitability of temper ensues, predominating over the muscular power of the mare, and consequently, as a rule, the stock inherits an irritable temper.

The question of age at which to commence breeding from a mare is one regarding which there is much variety of opinion. Some assert (and their practice is frequently followed) that a mare may, without injury to her constitution, be put to the horse at *two* years old. In our opinion, this is both unwise and to be censured. The principal argument—in fact, the only one in its favor—is that it saves a year's keep of the dam, and does not injure her future usefulness. But we have found many cases where, at three years old, a mare, after being pregnant, failed to develop those good points of which she had given early promise; and it holds to reason, that equally with the mother, as in the case of the sire, any undue demand upon nature still undeveloped and not matured must be succeeded by a corresponding deficiency in such development in future; and can the progeny of a raw, young, imperfectly-matured filly be expected to turn out a first-class and perfectly well formed animal, or to possess that robustness of constitution which the offspring of an older, and consequently more matured, mother inherits? No; while nature, in the form of the dam, is employed completing and perfecting her work, it is too much to expect that she can, from those very vessels under her finishing hand, produce at the same time a fully-nourished new form. The nutriment which goes to the fœtus should be alone the nutriment of the mother's own frame; and "a year's keep" is surely expensively saved, if it be at the cost of the future development of the dam, and production of "a weed!" And, doubtless, many weeds must be ascribed to this very pernicious practice, the full evils of which only become apparent when the animal is arriving at a mature age, and should naturally be supposed to be at its best.

In our experience, from five to six years of age seems the best period in a mare's existence at which to commence breeding from her. At such an age the breeder may hope for a continuance through many years of his mare giving him a foal; and when once a mother has proved herself capable of producing good stock, by all means, we say, continue to breed from her. For several reasons this is eminently advisable:—First, because she has proved herself to possess the requisite qualifications of breeding "true" to her own stamp, and to the lineage of her consort; Secondly, because we have frequently observed that such mares continue for years to breed finer and finer, gradually improving the quality of the stock if the sire's purity be adhered to; and, Thirdly, because a suitable consort has been found to beget in her the description of stock so much wanted.

When a mare is not put to the horse till she be aged, her stock is not likely to come to the same maturity or stature as that of a younger and more vigorous mother. As in the case of the sire, already referred to, if she have any inherent disposition to curbs, splints, spavins, and such deposits, her blood having become vitiated through their absorption, the chances are great that in every one of her foals, ere they are fully grown, such little defects will present themselves as shall not only lower their own value, but perpetuate such blemishes and evils to another generation.

Having then selected a mare adapted in age for a course of breeding, let us glance at a few of the more requisite points in her conformation and constitution. The first and grand virtue in every brood mare (but one too frequently little attended to) is *action*. This quality in a dam will render breeding or "blood" in her case less material, and we always prefer breeding from a plainer-looking mare if she possesses action, than from a fashionable-looking, higher-bred compeer without it. For it infers many other qualifications. It combines soundness with strength of muscle, and a healthy conformation of the legs and feet; and, besides this, it acts powerfully upon the offspring in preventing them taking too much after the racer style of going, and absence of knee action, so common in even the best thoroughbred sires. And as the muscles of locomotion are frequently considerably influenced by the nervous system, the style of action in a mare gives a very fair index, in many instances, to her temper and irritability.

In this particular (temper) it is also requisite to be careful in choosing a brood mare. It includes and implies docility to its full extent, and also courage, energy, and good will, to excite the physical powers and ability of endurance to the utmost, when required; and according to the ability of any hunter to exert these qualities to the fullest possible extent, will he take rank in the field and in the eye of every judge. Symmetry and size are of no avail without these great properties; and, as we think we have shown, the possession of them, in their primary degree, is *temper*. It is of much importance in the selection of a dam for hunting stock, and deserving of the utmost consideration, to choose a very lengthy, roomy mare, on short legs, probably about 15 hands 3 inches in height. Let her be taller and larger in every way than the sire, if possible; possessed of a wide barrel, large and round without appearing "baggy," with back-ribs well coupled up, and the girth round her chest wide and full. If she have a good shoulder, so much the better, but we do not insist upon that in selecting the cross which we have mentioned as in our experience the best—namely, a thoroughbred horse with a good shoulder and short back, and a lengthy half-bred or three-parts-bred mare. Her head should be well formed, and length and arch of neck is another desideratum. The bones of the legs should be flat, the fore arm should be brawny and muscularly prominent, all the legs be free from coarse hair as much as possible, and the hoofs should not be too flat and large, and the pastern joints, on no account, should be upright; the ears should also be well observed, as young stock very often follow the example of their dam in this respect. They should be fine and rather small, well pricked forward, and not wide set. The whole gait of the animal should be light and easy, and free from all symptoms of dull heaviness or sluggish motion. In a word, both sire and dam should display as little as possible of what is useless in any point; the greatest amount of good qualities combined in the most compact form of average size are what should be sought after in every instance.

The great difficulty in breeding is to retain sufficient size with an equivalent degree of muscle and spirit. Size or bulk, in either parent, indicates a degree of courseness in proportion as it predominates, and is not any indication of additional physical power. It cannot be said to show endurance, as heavy horses are rather a burden to themselves than otherwise, especially in the hunting field; and it is very difficult to procure a large heavy horse with breeding, sufficiently well provided with bone to render him lasting and enduring, when he has another's weight besides his own to carry across country.

Good wiry mares of bone and length, and well shaped, should always be chosen in preference to heavier animals, even if the sire be small himself. The produce of such will generally be found more handy, and to possess better symmetry, than the offspring of a union where the disparity in size is too apparent.

Large mares, moreover, we have frequently observed, are very uncertain in their foals; as a rule, these are either gigantic and coarse like the dams, or they take the other extreme, and prove puny weeds.

Incongruity in the proportions of the stock is the inevitable result of too wide disparity in the size and character (anatomically) of the parents.

But in selecting breeding parents we must not judge entirely by their external conformation. That is frequently fallacious, and there are other and worse difficulties to be avoided. Let us strongly warn every one against breeding too much in and in, as productive of the utmost degeneracy in the produce; and although regard for a certain lineage may to some seem mere prejudice, there is, we believe, much truth in it. Some families are remarkable for the transmission, through several generations, of good or of bad points. "Phœnix," an old and well-known stallion, begat most of his progeny with coarse bad hocks—an evil which several of his sons have perpetuated in their offspring; and as it is with flagrant vices, so also is it, and happily in a greater degree, with the rarest qualities of blood, form and temper. Constitutional unsoundness, and all hereditary infirmities, or even tendency to these, should at once exclude either sire or dam from the stud. These include the long list of ills to which fickle horseflesh is heir; and to secure a sound, healthy, powerful, and hardy offspring, the parents must not only themselves be free from all ailment (transmissible to their progeny) at the time of congress, but they should belong to families who have not been known to be remarkable for any peculiarity of form, or weakness of constitution, perpetuated or inherited from even a former generation. Lameness (other than the result of external accident), unsoundness of wind, even if caused by over-exertion, temper, color, markings of white, are all hereditary. We may here notice a very curious instance of the effect of an accident in a mare being perpetuated in the case of her foal. A neighboring farmer purchased, some years ago, a very nice-looking grey brood mare in foal. This was her first pregnancy. She had, through an accident, unfortunately got her eye knocked out, and owing to this blemish in her appearance, and subsequent habit of shying from her blindness on the one side, her owner gave up riding and driving her, and put her to the horse, intending to reserve her for breeding alone. Her foal was born, with the eyeball on the same side of the head on which its mother had received the injury, hanging out, and attached to the cheek-bone only by a thin piece of skin, which, of course, was at once cut away, and the unsightly object removed. This is certainly a remarkable instance, and is without any parallel in our experience. The mare was sold and lost sight of, unfortunately, so that we are unable to say if such a freak of nature was again repeated in her case.

As to color and particular individual markings in horses, we have said that these are also hereditary. The former runs in particular breeds to such an extent as to render them distinguished by it. Thus we have the white or cream-colored Arabian; the dun-colored Siberian or Tartarian; the brown Clydesdale; the black Lincolnshire; the chestnut Suffolk; and the bay Cleveland.

Even acquired and artificial habits become hereditary; nor are they transmitted by the agency of both parents. The dam may be very healthy, yet produce a weak and sickly offspring by one horse, when previously and subsequently her stock got by other stallions is perfectly robust and hardy; and *vice versa* in the parents; for cases frequently occur where the dams are as much to blame as the sires in this respect.

Having thus cursorily noticed the primary physiological principles which should guide every judicious breeder of young horses—namely, the careful selection of parents, due regard to their mutual conformation and assimilation to each other, as well as to their temper and constitutional hardihood, the propriety of endeavoring to trace back their family lineages, and to avoid all coarseness or other inherent vice or bad characteristic, to exclude from the stud any animal (male or female) predisposed to constitutional disease, unsoundness, or hereditary (and, in some cases, acquired) weaknesses—due regard to all which essential principles will go very far to insure success in this difficult enterprise—let us now in a few words sum up at present our remarks on this interesting subject.

We have recommended that one parent (and we think the sire) should be thoroughbred. There can be no doubt that the agency of blood on the paternal side very materially benefits and improves the stock. Some, however, assert that using what is popularly termed a "hunting sire," or stallion who only wants one part from being purely thoroughbred, is advantageous. To this we do not assent. We have tried them, and think them miserable failures as sires of first-class hunting-stock. Such a horse may be calculated for getting from well bred mares a stout, useful, strong-boned progeny, well enough adapted for harness purposes, and in some cases for roadsters, but as a hunting sire the epithet is undoubtedly a misnomer. His offspring as a rule are less courageous, and far less enduring, than the stock of a good thoroughbred stallion. Why is a sire selected at all, if not that his progeny may resemble him? and as we have seen that the property of imprinting his own qualities upon his stock is founded mainly on the purity and antiquity of the lineage of both parents, it naturally follows that, if there be a deficiency in this respect on the maternal side, the sire must indispensably be *pure.* As the horse, which the breeder wishes reproduced, was got, so let him try to repeat that cross; and this is surely not done by breeding *from* him with a similar mare, which will be found frequently to incur the risk of producing the coarser types of the ancestry of either side in a mongrel degree.

We object also to Arabian sires. Their progeny are as a rule small, undersized, and light of bone. They may be "sweet-looking" symmetrical animals, with showy action, and are well enough adapted for lady's pads, for which they are more suitable than for use as hunters or roadsters for heavy weight. Their too upright shoulders form their chief objection, and is an almost invariable fault in Arab stock.

A powerful *slow* horse, if thoroughbred, is not so objectionable, as he may be of much use in crossing mares of different classes, and thus horses adapted for different requirements may be bred. He is probably the best sire for roadster stock if crossed with a lengthy mare possessing high action.

When a mare has once been stinted to any horse *not* thoroughbred, the effects of such a union will be more or less apparent in her after progeny, even if they be got by a thoroughbred stallion. The ovarian system of the dam seems to imbibe certain influences from the sire which go to modify her progeny by other subsequent males; and by repeated intercourse with different sires, year after year, the property which the mare had of communicating her own family likeness and characteristics to her stock becomes much impaired. It takes less, year after year, after the dam; and, assuming that thoroughbreds only are admitted to any mare, the quality of the produce becomes year by year of higher quality (*not weedy)*, and more valuable.

Many instances of the effects of a previous fruitful intercourse presenting themselves in after years have come under our notice; but probably the most patent proof of it is to be found in the markings of white occurring in the produce of a sire and dam who are not only entirely free from any white themselves, but equally free from it in their ancestry, and which can only be accounted for by the fact that the mare had previously been served by a horse possessing such marks, either in his own form or that of his family. We once had a dun colored filly by "Clansman" out of a Highland pony mare—not a bad cross, by the way, to rear strong, hardy, undersized horses for pony carriages—and the hocks and thighs, as well as the forearm and face of this filly were striped and brindled like those of a zebra, caused by the pony mare having been served the previous year, and with success, by a donkey! She was put again to "Clansman," and again had a filly foal, brindled and striped in the same manner, though less decidedly than in the previous filly, and year by year her foals presented this appearance, though becoming gradually fainter and less conspicuous each successive year, although never becoming entirely obliterated.

Markings of white are, as a rule, rather inherited from the sire than from the dam, and traceable even to the grandsire and granddam.

New characters are sometimes implanted in stock, arising from the parents having been taken from their primitive condition and exposed to influences which are unnatural to them; and deviations in external structure of the stock are caused in like manner.

In these we include all such evils as contractions of the hoofs and feet, the result of bad shoeing; and they are not only themselves transmitted but they frequently assume a more serious aspect than mere malformations, causing a morbid local affection which often leads to permanent lameness and disease.

We have insisted thus much upon the influence exercised for good or for evil by the parents upon their progeny; and when any breeder has been so fortunate as to have found the combination of any two parents producing first-class stock for hunters and roadsters, we need hardly advise him to make no change by trying the services of another stallion, for after what has just been said he will probably find it impossible again to get the style of stock which he bred before he made the change of sire. Mares put successively to the same horse will continue to breed similar stock year after year.

To render more certain the state of pregnancy, and the condition of the fœtus more perfect, the keep of the horse and mare should, if possible, be more closely assimilated to each other before coition; and to every brood mare such nutriment should be given as is best calculated to establish a vigorous constitution. Upon this the robustness of the foal depends in a great measure, for in feeding the dam, the offspring is being fed at the same time, and in due proportion. An excellent way to aid the mare in nursing her foal, and at the same time to benefit both mare and foal, is to allow the mare, when going at grass, a daily supply of bruised oats of best quality, given in a shed or other convenient place in her paddock. The foal will thus very soon learn to eat along with her, and when it is weaned, the allowance given the dam should be continued to the foal, and should be liberal, and with due regard, at the same time, to the size of its stomach. It is a common practice amongst farmers to allow their young stock to feed merely upon what they can pick up, or to stint their diet in a straw-yard. This is poor economy, and no breeder is worthy of having a good foal, however careful he may be in his selection of sire and dam, and observant of all other precautions to insure success, who starves (for the sake of saving the expense of keep) his foals in their tender years, by not allowing such nutriment and quality of diet, and in such quantities, as shall assist nature in developing all her noblest qualities.

The two principal causes of the deterioration in the particular breeds of which we have been treating are, we think, to be found, first, in the want of attention to the proper selection of parents; and secondly, in the imperfect attention to the comfort and nutriment of the progeny. Let it ever be remembered that "like will produce like," and that the offspring, stinted in its youth, will not fail in the after development and conformation to exhibit the traces of such bad economy when it is too late to remedy the evil.

THE PAST, PRESENT AND FUTURE OF BRITISH AGRICULTURE.

READ BEFORE THE LONDON CENTRAL FARMER'S CLUB FEBRUARY 4, 1861.

55 B.C. TO A.D. 450.

If this country were without towns, cities, or roads, trade, commerce, or manufactures; and if the population were, consequently, solely agricultural, it would evidently be unnecessary to produce more corn or meat than would supply their own families, their lords, warriors, governors, clergy, and dependents. Pasture, wood, and waste would abound; and, as there would be no use for money, the proprietors of land would receive for their almost worthless acres, personal services or a portion of the produce.

Such was, in fact, the condition of Britain when, 55 years B.C., the Romans under Julius Cæsar landed in Kent, and, ultimately, conquered nearly the whole of South and Mid Britain, which they colonized and partially civilized, giving to the natives municipal institutions—a pretty good proof that in South and Mid Britain we were not so savage and barbarous a race as has been by some represented.

It is true that the North Britons were more fierce, barbarous, and warlike than those of the South; and that our cannie friends over the border were then, as now, determined to come South in search of the "loaves and fishes;" for, in spite of high walls and fortresses, the Romans could only partially check the inroads of the Picts and Scots. The Britons of that remote period were evidently agriculturists, having herds and flocks; and also, in the Southern districts, growing corn—the roofs of their wooden houses being thatched with straw. They also made hay, for the wheels of their war-chariots had scythe-blades attached to them; and having chariots, they must have understood making wheels. Although we have no authentic records before the time of the Romans, there is sufficient evidence to show that the British had for many centuries carried on a trade with the Phœnicians, who coveted the produce of her mines; and, in fact, the Belgians had partially colonized the southeastern coast.

No doubt the agriculturists of that day had their Webbs, Bakewells, and Collins; but they had no oil-cake, turnips, or clover to carry them through the winter. Having no Manchester manufacturers as their customers or suppliers, the ancient Britons depended principally upon nature for their clothing, in the shape of furs and skins, obtained by their skill as hunters in the extensive forests and coppices, or from the skins of their sheep and goats. Probably their nobles or Druids in the southern districts were clad in felted cloth. They grew woad, and used it for staining their bodies.

The Britons appear to have been a noble and finely developed race, as might naturally be expected from their happy climate and fertile soil; and it can be no flattery to our British women to say that their personal charms and virtues have, from the earliest recorded period, exercised a most salutary influence on our race and welfare; for we find every powerful nation, from the Romans to the Normans, intermarrying with our British women; and we have no record of the introduction of foreign women into this happy country. Strangely enough, I might quote my own case in proof of my argument, for my father was a Roman, and my grandfather a Saxon—my mother and grandmother being both English.

One thousand five hundred years ago, Britain had possessed for more than three centuries nearly the whole of the Roman civilization, such as personal security—and, after payment of Roman taxes, security of property—arts and letters, elegant and commodious buildings, and roads to which no roads they have had since can bear comparison, except our present railways. It is easy to imagine that under such circumstances, and with the instruction and encouragement imparted by Roman civilization, British agriculture improved and flourished, and not only supplied its own inhabitants, but exported corn to Rome.

The Romans were compelled by their domestic troubles finally to abandon Britain, A.D. 449.

449 TO 1066—NOW COMMENCED THE DARK OR MIDDLE AGE.

The Picts and Scots ravaged the south country; and the divided Britons, unable to cope with their fierce and barbarous enemies, called to their aid the Saxons. These wild, warlike, and pagan people liked the country so well that they speedily sent for their countrymen, and, eventually, became masters of Britain; having, however, to sustain frequent and bloody wars with the piratical Danes, who occasionally overran portions of the country.

Agriculture thus fared badly for several centuries, and we can easily believe Adam Smith, who says:

"When the German and Scythian nations overran the western provinces of the Roman empire, the confusions which followed so great a revolution lasted for several centuries. The rapine and violence which the barbarians exercised against the ancient inhabitants interrupted the commerce between the towns and the country. The towns were deserted, and the country left uncultivated; and the western provinces of Europe, which had enjoyed a considerable degree of opulence under the Roman Empire, sank into the lowest state of poverty and barbarism. During the continuance of those confusions, the chiefs and principal leaders of those nations acquired, or usurped to themselves, the greater part of the lands of those countries. A great part of them was uncultivated; but no part of them, whether cultivated or uncultivated, was left without a proprietor. All of them were engrossed, and the greater part by a few great proprietors.

"This original engrossing of uncultivated lands, though a great, might have been but a transitory, evil. They might soon have been divided again, and broken into small parcels, either by succession or alienation. The law of primogeniture hindered them from being divided by succession; the introduction of entails prevented their being broken into small parcels by alienation.

"But when land was considered as the means, not of subsistence merely, but of power and protection, it was thought better that it should descend undivided to one. In those disorderly times, every great landlord was a sort of petty prince. His tenants were his subjects. He was their judge, and, in some respects, their legislator in peace and their leader in war. He made war according to his own discretion, frequently against his neighbors, and sometimes against his sovereign."

When, however, they became, by admixture of race, Anglo-Saxons and Christianized, a great improvement gradually took place. They no longer sold their wives and daughters as slaves; and they appear to have been possessed of most of the usual live stock and implements of ancient agriculture. Murrain and famine alternately diminished their live stock and population, much as it does now in ignorant and pagan nations; and one-fifth of their herds perished every winter from exposure and want of food.

The wool of a sheep was valued at two-fifths of the price of the whole sheep.

A.D. 866.

In King Ethelred's time, the following prices were fixed by law:

	s.	d.		s.	d.
A man or slave	20	0	Ox	6	0
Horse	30	0	Swine	1	3
Mare or colt	20	0	Sheep	1	0
Ass or mule	12	0	Goat	0	2
Cow	5	0			

The lands belonging to the Church were generally the best cultivated. The monks themselves engaged in the labors of the field as a means of support.

Then, as now, the superior education and consequent intelligence of our clergy enabled them to improve agriculture.

1066 TO 1400.

In the eleventh century, William the Norman conquered England; and the foreign knights and others who accompanied him, or who afterwards settled here, made many improvements in horticulture and agriculture. They were, however, great game preservers, and their forest laws for its preservation were severe in the extreme. They delighted in the chase, planted the New Forest, and converted many extensive tracts of country into woodland as shelter for their game.

Their ruined castles abound in Essex and Suffolk. Within three miles of Tiptree Hall is a fine specimen of their architecture, called Layer Marney Tower—the adjoining church containing effigies of the Layer Marney family. As a rule, they selected good land. The population was now estimated at about 2,000,000.

The drainage of the fens of Cambridgeshire and Lincolnshire was commenced at this period, A.D. 1220. Our Scotch friends were considered behind us in farming.

Essex was one vast forest, and stood foremost in Domesday Book for its number of pigs, which there found their food under oak and beech trees: the number was 92,991—Hertfordshire having only 30,705. A great many goats were kept as stock; and, even now, very old men tell me of the fierce she-goats which rushed out upon them, some eighty years since, when Tiptree Heath was a wild and wooded waste.

Lords of the manor had considerable privileges. They monopolized all the water mills; their tenants were compelled to send their corn to them to be ground. The lord of the manor monopolized also the privilege of baking his tenants' bread at the common "fourne." Windmills were not known in England until about 1150.

The shoeing of horses with iron is not supposed to have been used before the Conquest. Horses were rarely used in agriculture.

As there is much discussion just now about wearing beards, it may be interesting to know that our laity all wore beards until the Norman Conquest; so I suppose the Normans cropped as well as conquered us. They were, themselves, close shaved or cropped; for the spies reported to King Harold that they had whole regiments of priests, inferring from the practice of our then clergy that close-cropping and priestcraft were synonymous. Our agriculturists will, therefore, be justified by precedent in discarding their razors.

Landowners were not without their troubles; for in the reign of Edward II., 1307, the estate of the elder Spencer, in Suffolk, was ravaged by his enemies, who carried off 28,000 sheep, 1,000 oxen and heifers, 1,200 cows with their calves for two years, 500 cart horses, and 3,000 hogs.

In 1317 harvest was all gathered by the 1st of September, and wheat fell to one-twelfth of the price at which it had been sold a few weeks previously. The fluctuations in the prices of corn seem to have been much greater formerly than of late years.

In 1202	it was	£0	12	0	per quarter.
1223	“	0	12	0	“
1237	“	0	3	4	“
1243	“	0	2	0	“
1244	“	0	2	0	“
1246	“	0	16	0	“
1257	“	0	4	0	“
1258	“	1	0	0	“
1270	“	4	16	0	“
“	“	6	8	0	“
1286	“	0	2	8	“
“	“	0	16	0	“

Considering the high value of money at these periods, it is easy to imagine what suffering, starvation and disease must have followed the years of scarcity. Such enormous fluctuations could only arise from a concurrence of other evils with an unpropitious season, such as invasion, civil war, and rebellion, from which, thank God, we are now exempt; and we ought highly to prize the blessings of good government, and good laws well administered, which we now enjoy. Much of our progress is founded on a conviction that life and property and liberty are secure in this happy country. Farmers are no longer called villains and churls, subject at any moment to do military or other service, at the command of their lords; nor have they to guard their flocks and property against the thousands of robbers and murderers who formerly infested this country.

The proportion of pasture land to arable gradually decreased, but was still as twenty to one. The steward of the manor (Hawstead, in Suffolk,) kept the manorial and farm stock accounts *in Latin.* This would now puzzle some of our modern stewards.

A.D. 1400 TO 1480.

During this period our flock masters must have improved the quality of their wool, "the chief and principal commodity of the realm," for it was highly esteemed abroad, and the demand exceeded the supply. I presume the mutton was also improved, and that the animals were better fed, for in former times sheep were kept for their wool only.

"Villains" were gradually emancipated, and became free laborers, and a new class of cultivators arose, paying money rents.

At the Hawstead Manor Farm, Suffolk, (Sir T. Cullum's), the produce of sixty-one acres of wheat for three years was 210 quarters, about nine bushels per acre; and as the price was low, this was no doubt a good crop, and certainly the farming would be quite equal to or above the average. The quantity of seed sown was two bushels and a half, so that the return was hardly four for one.

The produce of the different grains at that period, on that farm, was—

Wheat	8 bushels.
Barley	12 "
Peas	12 "
Oats	6 "

—a very small return for the quantity of seed sown, and something like what is now grown in many foreign countries that supply our market.

In the fifteenth century, much arable land was laid down to pasture, on account of the high price of wool, and also because of the scarcity of labor. The villeins, having been made free laborers, betook themselves to handicrafts and manufactures.

Land appears to have been let still at cheap rates, say fourpence to eightpence an acre, and it must have been of a fair average quality, as it was on Sir Thomas Cullum's estate, in Suffolk; in fact, in 1490, the abbot of Bury, Suffolk, let eighteen acres of pasture, on a lease of eighty years, for fourpence-halfpenny per acre. Landlords reserved to themselves the right of immediate re-entry if the rents were not punctually paid.

As to wages at this time, a bailiff received twenty-five shillings a year, besides meat and drink, and five shillings a year for clothing. A chief hind, carter, or shepherd, twenty shillings, and for clothing, four shillings; a woman servant ten shilling, with four shillings for clothing; a common laborer, fifteen shillings, and three shillings and fourpence for clothing, and he seems to have been left to provide his own diet.

In harvest, wages were higher—say fourpence—with meat and drink, or sixpence if he provided for himself; a reaper or a carter, threepence with, and fivepence without, provision; a woman, twopence-halfpenny with, or fourpence-halfpenny without. These wages were fixed by statute, but still laborers became scarce. Cotteswold wool was in great demand by the Flemings, Venetians, and others, for the manufacture of fine cloths; and it is said that Cotteswold sheep, being sent to Spain, produced—as a result, I presume, by a cross—the celebrated Merino. We had not at that time learned the art of working up our fine wool at home; we were at this period exporters of grain to foreign parts, and a law was passed to compel boroughs, towns, &c., to provide a standard bushel measure. The use of coal became now more general. How oddly this sounds to us who know that last year the consumption of the twenty-one mile circle around London was 5,000,000 tons, of which 1,500,000 tons came by rail.

1408 TO 1608.

During this period a large advance was made in our agricultural condition: farmers passed from wooden trenchers and wooden spoons to pewter, and even in some cases to silver; their straw pallet was exchanged for a feather bed, and their rents were doubled. The softer sex also found their condition ameliorated. All this took place concurrently with, and as a corollary to, our progress in manufactures and commerce.

COMFORT FOR THE BRITISH LANDOWNER.

Adam Smith says, in his "Wealth of Nations:"—

"Every improvement in the circumstances of the society tends, either directly or indirectly, to raise the real rent of land, to increase the real wealth of the landlord, his power of purchasing the labor, or the produce of the labor of other people.

"The extension of improvement and cultivation tends to raise it directly. The landlord's share of the produce necessarily increases with the increase of the produce.

"That rise in the real price of those parts of the rude produce of land which is, first, the effect of the extended improvement and cultivation, and, afterwards, the cause of their being still further extended; the rise in the price of cattle, for example, tends, too, to raise the rent of land directly, and in a still greater proportion. The real value of the landlord's share, his real command of the labor of other people, not only rises with the real value of the produce, but the proportion of his share to the whole produce rises with it.

"All those improvements in the productive powers of labor which tend directly to reduce the rent-price of manufacturers, tend indirectly to raise the real rent of land.

"Every increase in the real wealth of the society, every increase in the quantity of useful labor employed within it, tends indirectly to raise the real rent of land.

"The contrary circumstances—the neglect of cultivation and improvement, the fall in the real price of any part of the rude produce of land, the rise in the real price of manufactures from the decay of manufacturing art and industry, the declension of the real wealth of the society—all tend, on the other hand, to lower the real rent of land, to reduce the real wealth of the landlord, to diminish his power of purchasing either the labor or the produce of the labor of other people."

1600 TO 1660.

Matters moved slowly during this period. In agriculture, gardening, and manufactures, England was surpassed by several other countries, particularly by Holland and the Netherlands. These were the most industrious countries in Europe, and their population had been longer trained in those habits of order which are essential to industrial pre-eminence, and in which ours was deficient. Our Dutch and Flemish neighbors improved us in fen drainage, and in reclaiming land from the sea; they also introduced new seeds, and improved our agricultural practice. Implements and usages still varied in every county, and almost in every parish. Bligh, in his "Improver Improved" (1652), pointed out the advantage of growing clover for cattle; and Sir Richard Weston soon after published an account of the cultivation of turnips in Flanders, by which cattle and sheep might be fattened in winter. The woolen was still the most important branch of non-agricultural industry.

Hackney-coaches made their first appearance in 1625, there being only twenty for the metropolis and its neighborhood.

1660 TO 1760.

Our manufactures continued to improve by instruction from other countries, and the exportation of wool was now prohibited. Spitalfields, in London, now produced silk manufactures; and Frenchmen, at Ipswich, made fine linen, which sold at 15*s.* per ell—an enormous price, looking at the then great value of money. Agriculture also advanced. The historian says:—

"The state of things to which the Revolution of 1688 put to termination was favorable to the development of agricultural industry during the present period. Other political circumstances also favored the landed interest; and, for eighty years after the Revolution, England, as we have seen, was a corn-exporting country—(from 1697 to 1773 the total excess of exports amounted to 30,968,366 quarters of corn, upon which bounties were paid of not less than £6,237,176. From 1748 to 1752 the average quantity exported was 643,961 quarters annually. The bounty paid in 1750 amounted to £324,176)—fresh land was brought into cultivation, and in 1710 the first Enclosure Act was passed. In 1697 a duty was laid in England on malt, and the same duty was extended to Scotland in 1713. In 1710 the winnowing-machine was introduced from Holland; in Scotland its use was denounced from the pulpit as impious. The threshing-machine was first employed in the northern parts of the island about the same time: no instrument for saving labor has made such slow progress, and in many extensive districts its use is unknown even in the present day. In 1732, Jethro Tull commenced his experiments in drilling and horse-hoeing on his farm in Berkshire; but thirty years elapsed before they excited much practical attention, and before the really valuable parts of his system began to be adopted by intelligent agriculturists. Towards the close of the period, the extension of the turnip husbandry was already effecting the important revolution in the history of modern agriculture. Those improvements were also commenced which have gone far towards eradicating the defects of the ancient breeds of domestic animals in this country: Bakewell, the great improver of live-stock, began his experiments about the year 1760.

"The writings of Evelyn, published near the close of the last period, had awakened a taste for horticulture and planting. Gardens had become a luxury on which large sums were expended; the cottage of the laborer began to be considered incomplete without a plot of ground for the cultivation of vegetables; and a great increase took place in the quantity and variety of vegetables consumed by the laboring classes.

"The farmer who did not provide plenty of greens, peas, and beans for his servants, to eat with their salt meat, was despised for his parsimony. By the middle of the century the cultivation of the potatoe had become almost general in every part of England, and the prejudice against its use had been nearly removed; but in some quarters premiums were still resorted to, for the purpose of bringing this root into consumption amongst the poor."

1760 TO 1860.

This being decidedly the most progressive era in the history of British agriculture, I have annexed a chronological table of the many important agricultural events of that period, which progress was still mainly owing to our great manufacturing advance, and consequent rapid increase of population. Judging of the future by the past, what are we to expect in agricultural progress from 1860 to 1960, with a population of fifty or sixty millions, instead of thirty millions? Our population was, a century ago, probably not more than six or seven millions, now it is thirty millions. The mind naturally asks, how long is this manufacturing increase to go on, and when shall our manufactures have attained their climax, and when shall commence their decline? Because then shall, indeed, begin the decay of British agriculture. Begging pardon for this digression, I must again quote from the historian of that period. In 1784 roads had improved, and Mr. Palmer started the first mail-coach; previous to this, 380 towns got their letters only three times a week, and forty towns had no post at all, but now they get them daily.

From 1785 to 1800 there were 683 Acts of Parliament relating to roads, bridges, &c.; 196 to canals; 834 to enclosures, draining, &c.

LEGISLATION AFFECTING AGRICULTURE.

Our senators appear to have been constantly attempting to set agriculture in order, according to their own notions, by Acts of Parliaments. They do not appear to have succeeded very well in their objects, for most of the Acts fell into desuetude, or were evaded. some of them would sound odly at the present day, such as—

No tenant should rent two farms.

No tenant farmer should have more than 2,000 sheep.

1538. That the king was to have half the profit from all land converted from tillage into pasture until a suitable house was built upon it.

Every cottage was to have four acres of land; and no more than one family in each cottage.

There was an Act to restrain the excessive use of malt, and justices were empowered in quarter sessions to suppress the making of malt, and the number of malsters.

Farm-houses that had decayed were to be rebuilt compulsorily, and 20 to 40 acres of land attached to them.

Roast beef at Christmas appears to have been a luxury of modern times, thanks to turnips, mangel, cake, clover, and other winter food; for, formerly, as soon as the depasturing season ended, the fat animals were killed and salted, to prevent there becoming lean again—the hay being required for cows and young growing animals. Bullocks and sheep, too, were then a long while growing to perfection for the butcher, much as it is now in many foreign countries, whose agriculturists—when they visit England—express surprise that our live stock should be so large and so fat at so early an age.

ROADS, CANALS, AND RAILROADS.

One hundred years ago we were without either, and in winter the country was impassable. Arthur Young, in his tours, execrated the ruts, four feet deep, on what were called roads in his time. I wish time would permit me to transcribe his graphic description of the difficulties of locomotion and intercommunication

After carriages were invented the nobility and gentry had their "footmen," who ran by the sides of carriages, and with their long sticks, which are now used for ornament, propped up the carriage when in danger of turning over.

THE GOVERNMENT DRAINAGE LOANS.

If evidence were wanting of the necessity for aggregating capital in the hands of great companies for the purpose of agricultural improvement, we should find it in the eagerness with which the first government loan of two millions sterling was taken up and made use of. Our keen Scotch friends were so alive to its advantages that they took the whole, and our less 'cute Southerners were too late in their application. So in the second loan of a million, a portion was reserved for the tardy Englishmen.

A noble duke, a great and acute improver, who had an immense estate in Scotland, told me that he had a large slice of the first loan, and would have taken much more had he been permitted to do so.

The establishment of

THE GENERAL BOARD OF HEALTH

has had a most beneficial influence on the sanitary condition of the nation; but, oddly and inconsistently enough, the tendency of its operation is to deprive the British people of their food; for the only means by which the national food can be permanently produced is by means of those very excrements which the Board of Health Act does not direct to be applied to the soil, but which are wasted in polluting our rivers. The calamitous national effects which must untimately result from this suicidal system have been already duly commented upon in the paper I had the honor to read before you, "On the Sewage of Towns as it affects British Agriculture;" I will, therefore, only say that, if the Legislature does not interfere to compel a different appropriation of the sewage, I trust that the land-holders and farmers of this kingdom will exert themselves to prevent so fatal and so palpable a waste of their substance.

THE NEW POOR LAW OF 1834

saved this country from desolation, and agriculture from destruction; it taught the landholder and his tenant that property had its duties as well as its rights, and that agriculture was never in greater error than when it hoped to save itself by the non-employment of human labor. It also proved that to pauperize the laborer by paying his wages as alms was to destroy his self-dependence and demoralize his character.

THE TITHE COMMUTATION ACT OF 836

opened the flood-gates of investment and improvement, where they would not otherwise have entered. It has also removed an element of embitterment between the clergy and their flocks, and has greatly promoted the cause of religion and kind feeling. It caused the conversion of many woods and waste into food-producing soil.

Tithes were first imposed upon the Mercians in the latter part of the eighth century, by their king, Offa; and the tax was extended over all England by King Ethelwolf in 855. Owing to the great extent of forest and waste, the total must have been small. Tithes were applied to the repair of churches, the expenses of worship, and the relief of the poor, as well as to the maintenance of the clergy. Pious individuals, however, contributed lavishly with lands, &c., and so enriched the Church. This is now prevented by the law of mortmain.

RICHARD COBDEN AND SIR ROBERT PEEL.

I do not venture to give an opinion on the much-vexed political questions involved by their names, for that is very properly forbidden by the rules of our club; but, practically, free trade has done for British agriculture an enormous good. It has awakened the slumbering and heretofore unsuspected powers of the British Agricultural Lion. We all must well remember that the anticipation of a ruinous and impossible competition sorrowed the minds and angered the feelings of those who thought they saw in free trade the loss of their capital and ruin of their families. But fear and despair gave way to reflection, and to the comprehension of his exact comparative position. The British farmer, like the British manufacturer, faced the difficulty, and has sustained the competitive race by rapid improvement. That great race, although sustained, will be more than won by unheard-of and future progress, and half a century hence our agricultural grandchildren will look back upon the condition of their progenitors much as we do on ours of the past age.

THE ACT FOR THE ENFRANCHISEMENT OF COPYHOLDS

will gradually sweep away the old feudal responsibilities, and give security to improvers.

A copyhold farm of my own is subject to a live heriot at my death; and no doubt, when that occurs, the steward to the lord of the manor will claim my best horse or bullock, as well as one and a half year's rent.

IMPLEMENT IMPROVERS.

We owe to Tull the drill and horse-hoe, to Bell the reaper, and to Meikle the threshing machine. The two last were Scotchmen. It is hardly possible to overrate the important benefits these implements will confer on British agriculture. The time and money they save largely aid us in a successful competition with foreigners. It is a singular but significant fact that, although Mr. Bell had used the reaper (invented by his brother, the Rev. Patrick Bell, still living at Carmyllie, near Arbroath, who in 1828 received a £50 prize for it from the Highland Agricultural Society) for thirty years, no one seemed to know anything about it; and when his machine (Americanized) appeared in the Great Exhibition of 1851, they were regarded as curiosities and novelties.

The public trial of them on my farm, in 1851, in the presence of a distinguished company, at once launched them into practical use. I have used one of them ever since.

AGRICULTURAL IMPLEMENTS AND MACHINERY.

If I wished to convince agriculturists of the importance of steam, I would, in their presence, ask the implement makers how much they would enhance their prices if compelled to go back to manual labor or horse-power as a motive force? The answer would probably be, "It is not a question of price, for we could not produce enough even at an advance of 50 to 100 per cent." As I wander through the implemental labyrinth at our great shows, I ponder in my mind whether farmers entertained this question, and applied it to their own case. We no longer see the farmer or his men making their own wooden plow and other tools at home as in ancient times; but the steam-blast, the steam-hammer, the steam circular saw, and the steam-turned lathe have transformed our blacksmiths' shops into gigantic and money-making factories, whence agriculture derives the chief and effective means of a successful competition with less advanced corn-growing countries.

It would be ungracious to omit honorable mention of the Ransomes, Garretts, Hornsbys, Claytons, Howards, Barretts, and others, who have so admirably met the mechanical demands of modern agriculture.

It is my lot to welcome many foreign agriculturists, and, as I catechize them, I often wish that I had by my side the agricultural alarmists. They would hear them say—"We have no roads, or we cannot use them in bad weather. We have the old wooden plow; we never hoe our corn, our men do not understand this machinery; we do not drill our corn; we keep our sheep three or four years before they are fat. We use no oil-cake; our animals live on straw in the winter; we are very far from a market or river;* we have no railways or canals; we grow three, four, or five bushels for one." A brother of a neighbor of mine emigrated to America, and writing to his brother, said, "I expect to see something of the country, for so-and-so is going out with a load of corn to market (Chicago); he will be gone three weeks, as it is seventy miles away." This I know to be a fact. It is a variety of these difficulties which beset the foreign cheap producer; and it is the reverse of all this that comforts and profits the British farmer.

THE ESTABLISHMENT OF FARMERS' CLUBS AND AGRICULTURAL SOCIETIES

has had a most beneficial influence on agricultural progress, which has been stimulated and improved by competitive exhibitions, by the reading of papers on agricultural subjects, by the discussions following thereon, and, above all, by the diffusion of those readings and discussions by means of the agricultural press.

It is a painful, unaccountable, and not very creditable fact, that the only society in Britain that forbids the free and public reporting of its discussions and proceedings is the Royal Agricultural Society of England!† In other respects it has conferred great benefits on British agriculture, especially by its itinerating annual exhibitions for live stock and machinery. Its *Journal* has also done good service. The same good results have followed from the Highland Society and its *Journal*, and the Irish Agricultural Society and its *Journal*, and their exhibitions.

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* Trollope, in his "America," gives the expenses of Indian corn conveyed to Liverpool at seven times its cost at Illinois or places of growth.

† October, 1862. I am glad to find that this prohibition has been modified or withdrawn.

It would be doing an injustice to Scotch agriculturists not to compliment them on the talent displayed at their discussions, resulting, no doubt, from those more abundant educational facilities which have existed in Scotland, compulsorily, more than in England. Probably this was the cause of their *Agricultural Journal* appearing so many years before that of the English Society.

THE SMITHFIELD CLUB,

by its early and original exhibition of live stock, deserves especial commendation as the pioneer in animal competitive exhibitions, which have dispelled self-sufficiency and developed animal perfection.

Among the greatest benefactors to agriculture stands

BARON LIEBIG.

If an accurate account could be taken of the quantity and value of the additional food produced through his discoveries, the world would be grateful, and we should look upon him as a great benefactor to mankind. By the light of his great mind, the darkness of agriculture with regard to the nutrition of plants and of animals, is being rapidly dispelled. Like a great magician, he has taught us to convert bones and mineral apatite into milk, cheese, mutton, and beef. He has taught us that the earth on which we tread forms an indispensable portion of animal and vegetable structure. He discovered, floating in the passing breeze, the fat and muscle of our bodies.

The once exhausted pastures of Cheshire owe to him their fruitful regeneration, and every Cheshire cheese should in gratitude bear his impress.

As an eminent chemist remarked to me the other day—"he has knocked down all the old skittles,"—meaning the old erroneous agricultural theories.

He has supplanted them by imperishable truths.

He pointed out to us, in perspective, why a "peppering" of guano rivalled the massive dung-heap.

He has entreated us to believe that the waste of our excreta through our sewers is equal to an enormous exportation of corn and meat without receiving its value in return. I am a firm believer in his mineral theory. Agriculture will, at some future age, raise a monument to his memory as the Sir Isaac Newton of agricultural discovery.

WHAT MODERN AGRICULTURAL PROGRESS OWES TO MANUFACTURES

Let us ask how it is that within the last seventy years agriculture has made such enormous strides as compared with its former history? The answer is ready and simple. We have become the workshop of the world; nearly nine-tenths of our population are engaged in, or dependent upon, manufactures, commerce, trade, and other occupations, non-agricultural, whilst this once purely agricultural people represent now only one-tenth of the national population. Agriculture owes nearly its all to the spinning-jenny, the power-loom, the mule, and the thousands of new inventions and new occupations of modern times. Mighty steam pours into the national lap the estimated labors of a supposed population equal to that of the whole world. The well-to-do and multiplied millions, under ground, above ground, on the broad waters and on the busy rail, make greedy and unsatisfied demands on the British farmer, who, shame to say, helpless and powerless, is unable, because unwilling, to respond to the call. Like a negligent shopkeeper, he compels his best customers to deal with and strengthen his competitors' hands over the water. Is there one agriculturist who can still harbor in his mind a lerking belief that his own interest is opposed to that of trade, commerce and manufactures? If so, let him sweep away, in his imagination, the towns, the cities, and factories, and iron and coal mines, and railways, and mercantile fleets; and let him fancy himself like the ancient Briton, a producer with no other customer than himself, his lord, his warriors, and his governors.

THERE WAS A TIME WHEN AGRICULTURE CAST A JEALOUS AND DISAPPROVING EYE ON MANUFACTURERS,

but I trust intelligence has removed it. It is precisely because British farmers have their customers—the British manufacturers—almost at their doors, and that other corn-producing countries have *not* any manufacturers, that British agriculture is more rich and thriving. The larger the population employed in manufacturing for foreigners, the better for the English farmer and the English landlord; for no doubt the latter will always participate largely in the farmer's well-doing.

Farmers and country gentlemen sometimes look with an unkindly eye on apron-string farmers or cotton lords; but this should not be. Hear what Adam Smith says in his "Wealth of Nations," page 167:

HOW THE COMMERCE OF TOWNS CONTRIBUTED TO THE IMPROVEMENT OF THE COUNTRY.

"The increase and riches of commercial and manufacturing towns contributed to the improvement and cultivation of the countries to which they belonged in three different ways:—

"First, by affording a great and ready market for the rude produce of the country, they gave encouragement to its cultivation and further improvement. This benefit was not even confined to the countries in which they were situated, but extended more or less to all those with which they had any dealings. To all of them they afforded a market for some part either of their rude or manufactured produce, and, consequently, gave some encouragement to the industry and improvement of all. Their own country, however, on account of its neighborhood, necessarily derived the greatest benefit from this market. Its rude produce being charged with less carriage, the traders could pay the growers a better price for it, and yet afford it as cheap to the consumers as that of more distant countries.

"Secondly, the wealth acquired by the inhabitants of cities was frequently employed in purchasing such lands as were to be sold, of which a great part would frequently be uncultivated. Merchants are commonly ambitious of becoming country gentlemen, and, when they do, they are generally the best of all improvers. A merchant is accustomed to employ his money chiefly in profitable projects; whereas a mere country gentleman is accustomed to employ it chiefly in expense. The one often sees his money go from him, and return to him again with a profit; the other, when once he parts with it, very seldom expects to see any more of it. Those different habits naturally affect their temper and disposition in every sort of business. The merchant is commonly a bold, a country gentleman a timid, undertaker. The one is not afraid to lay out at once a large capital upon the improvement of his land, when he has a probable prospect of raising the value of it in proportion to the expense; the other, if he has any capital, which is not always the case, seldom ventures to employ it in this manner. If he improves at all, it is commonly not with a capital, but with what he can save out of his annual revenue. Whoever has had the fortune to live in a mercantile town, situated in an unimproved country, must have frequently observed how much more spirited the operations of merchants were in this way than those of mere country gentlemen. The habits, besides, of order, economy, and attention, to which mercantile business naturally forms a merchant, render him much fitter to execute, with profit and success, any project of improvement.

"Thirdly and lastly, commerce and manufactures gradually introduced order and good government, and with them the liberty and security of individuals, among the inhabitants of the country, who had before lived almost in a continual state of war with their neighbors, and of servile dependency upon their superiors. This, though it has been the least observed, is by far the most important of all their effects. Mr. Hume is the only writer who, as far as I know, has hitherto taken notice of it."

THE EFFECT OF A NEW AND EXTENSIVE GOLD FINDING affects the "price" of agricultural produce, if not its "value," as shown by the following extract from Doubleday's "Financial History of England," and, no doubt, is doing so now:

"The grand alteration in the value of the precious metals, and, of course, of money along with them, to which I would refer the reader, is that which took place in about thirty years after the discovery of America, by Columbus, in A. D. 1492. The reign of Henry VIII. commenced in A. D. 1509. Before he had reigned twenty years, the conquest of Mexico and Peru had been completed by the Spaniards; and the Portuguese were busy in the Brazils, which they ultimately overran and subdued. From that time, that is to say, from the early part of the reign of Henry VIII., gold and silver continued to be poured into Europe, in unprecedented plenty, throughout the period comprised in the sixteenth and seventeenth centuries, causing a continually growing circulation of money, and a rise of prices in all commodities over all Europe, for which men were puzzled how to account, and which began to be sensibly felt in England about the middle of Henry's reign. This was the first time that men had witnessed the phenomena of a huge accession, all within a few years, to the precious metals then circulating; and to those living at the time the whole was a puzzle and a mystery. The enhanced prices were in England wholly attributed to monopoly; to hoarding; to forestalling; to large farms; to any cause but the true cause; which true cause was *the lowering of the value of gold and silver*, by the discovery of the rich mines of Mexico, Peru, and ultimately of the Brazils. To prove, then, the real effect of this vast and rapid addition to the circulating medium, we have only to take a bird's-eye view of the prices before and after the event. Let us begin with wheat. The following is extracted from Adam Smith's 'Wealth of Nations:'

PRICES OF WHEAT BEFORE AND AFTER THE OPENING OF THE AMERICAN MINES.

	£	s.	d.	
Average A. D. 1423 to 1451	0	10	7	per quarter.
" 1453 to 1497	0	8	5	"
" 1459 to 1560	0	9	2	"
" 1561 to 1601	2	7	5	"
" 1595 to 1636	2	10	0	"
" 1637 to 1700	2	11	3	"

"Here we see, that during the period between 1561 and 1601, a space of forty years, the average price of wheat has grown five fold. Not that grain was scarce during those forty years, but because, throughout the whole of them, the precious metals came pouring into Europe from Peru and Mexico, with a rapidity almost inconceivable.

“To show that the same effects were produced upon the prices of all sorts of merchandise and commodities, I subjoin a curious document, extracted from Drake's ‘Eboracum:’

TABLE OF PRICES.

Prices proclaimed at York, 1393.	£	s.	d.
Strong Beer, per gal	0	0	1½
A milder sort, “	0	0	1
Finest Claret Wine, per gal	0	0	8
All common White Wines, do	0	0	6
Carcass of finest Beef	1	0	8
Next best	0	14	0
Scotch Kyloe Ox carcass	0	12	0
Ditto Cow	0	10	0
Carcass of Mutton, best	0	1	8
Ditto, worse fed	0	1	6
Carcass of fine Veal	0	2	6
Another sort, ditto	0	1	6
A Lamb	0	0	8
A fat Pork Hog	0	3	4
A smaller Pig	0	3	0
A Capon	0	0	4
A Hen	0	0	1½
A fat Goose	0	0	4
A dozen of Pidgeons	0	0	3
A Woodcock	0	0	1½
A Teal	0	0	1½

Prices at York in 1733.	£	s.	d.
Strong Beer, per gal	0	2	0
Mild Ale, “	0	1	0
Best Claret, “	0	17	0
White Port, “	0	8	0
Red Port, “	0	6	8
Choice carcass of Beef	9	10	0
Next best	8	0	0
Scotch Kyloe	4	4	0
Cow, ditto	3	0	0
Carcass of Mutton, ditto	1	10	0
Ditto, worse fed	1	0	0
Carcass of fine Veal	1	6	0
Another sort, ditto	0	15	0
A Lamb	0	12	0
A fat Pork Hog	2	10	0
A smaller Pig	2	0	0
A Capon	0	1	9
A Hen	0	0	9
A fat Goose	0	2	0
A dozen Pidgeons	0	1	3
A Woodcock	0	0	9
A Teal	0	0	9

THE PRESENT AND PAST CONDITION OF AGRICULTURE IN ITS RELATION TO MANUFACTURES.

Agriculture enjoys greater privileges and advantages now in comparison with former times. The skill, capital, and enterprise of our manufacturers, aided by that great invention, steam, has raised up an enormous population of customers, non-agricultural, placed at the disposal of agriculture cheap and abundant clothing, as well as more perfect and less costly implements of agriculture. In 1487, three quarters of corn were given for one yard of fine broadcloth; now, the quantity obtainable would be near eight yards. Nobody wore knitted stockings until Queen Elizabeth's reign. She is said to have been the first person in England to wear them. She received them as a present from the Spanish ambassador. We all know that our ploughshares and other agricultural implements harmonize in reduction of price with our cheap cotton and woollen manufactures.

The village church on the Sabbath presents the pleasing pattern-card of elegance and cheapness. The wife and children of the agricultural laborer, whose weekly wages represent the value of one bushel of flour, are clad in colors, patterns, and qualities that convince the observer how much agriculture owes to the science and skill of manufactures.

The recent discovery of the sewing-machine has multiplied by millions the powers of the seamstresses. But how has all this been brought about?

Not by an obstinate adherence to old customs, but by a recognition of the value of science and by an availment of its powers. In this respect agriculture has much to learn from manufactures, and must make haste to follow its example.

THE FUTURE OF AGRICULTURE MUST BE BASED ON A GENERAL USE OF STEAM POWER.

This has made manufacture what it is, and will make agriculture what it ought to be. At present we can scarcely say that agriculture has used steam—possibly she may now have 50,000 horse power—she will soon have, at least, a million of horse power. I speak practically and guardedly on this matter. Every farmery of 100 acres will, for the purpose of cultivation and general manipulation, require four horse power. If 100 acres require four horse power, sixty millions of acres will require 2,400,000 horse power.

THE TOPOGRAPHY OF OUR FARMS INFLICTS A GIGANTIC CHARGE ON FARM PRODUCTS.

It is singular that whilst, 1400 years ago, the civilized Romans left with us indestructible examples of facile inter-communication by broad and well made roads, straight as the flight of an arrow, we content ourselves with perfect contortions in our roads and lanes. To sit down and calculate in detail the loss occasioned by these deviations from rectitude would produce an alarming and astounding aggregate. But how is this now to be remedied? No one will attempt the task with our present cumbrous, costly, and ridiculous mode of transfer; and so one item, or rather one means, of a successful competition with foreign production is debarred from us.

The financial history of the cost of a quarter of wheat, in all its details, would afford an instructive and profitable lesson, and would exhibit a biting satire and a severe rebuke. It would humble our agricultural pride, and would show that we cannot, as agriculturists, stand the test of commercial criticism.

When I say this, let it be understood that I especially refer to the duties and shortcomings of landowners, who, being principally our lawgivers, have the power (if they choose to exercise it) of amending the laws of conveyancing.

Assuming that the frequent removal of heavy steam-engines and machinery from one part of the farm to another, or from one farm to another, will render necessary temporary railroads, or very improved public and farm roads, it becomes of the utmost importance, on the score of economy, that our agricultural topography should be amended.

A farm of 640 acres would fill one square mile—the buildings being central and the roads straight, every portion would be readily accessible; but, if a survey were to be given to us of the existing topography of every farm of that size, it would reveal a barbarous waste of means intolerable in this age of practical economy.

The importance of

IMPROVED MEANS OF LOCOMOTION FOR OUR FARM STEAM ENGINES

is well illustrated by the following fact:—

On a recent visit to a spirited improver, on a heavy-land farm, I saw Fowler's steam-plough working a circular saw instead of drawing the ploughs. "You see," said my friend, "here is my £700 worth of power unavailable for cultivation. It weighs seven tons, and, although our land is drained, it is impossible to get it about our stiff clays. I purpose laying down a light rail for it, through the centre of this 250 acre piece, so that its power may be at any time exerted, either on the land or in the farmyard." And this reminds me how unreasonable it is of the Royal Agricultural Society of England to try all their implements in the hot dry month of July, when the winter difficulties of a stiff clay farm are thus practically ignored. Let us hope that the prize-sheet of this Society will offer prizes for the best and cheapest railway means of rendering steam-power available at all seasons, except during severe frost. I am gradually coming to the conclusion that such means will be a necessary concomitant of steam culture, as it has been to our locomotion. It must not be forgotten that one meritorious feature of Mr. Smith's, of Woolston, system of steam culture is, that there is very little necessity for removing the heavy engine—a great advantage in wet seasons on a heavy-land farm.

While on this subject permit me to quote a letter from Mr. Pike, which illustrates most forcibly, clearly, practically, and truthfully the enormous advantages resulting from

THE USE OF STEAM IN CULTIVATION,*

and of the necessity for fixity of engine in wet weather on stiff clays:—

"*Stevington, near Bedford, Dec.* 31, 1860.

"GENTLEMEN:—I very willingly send you my views and opinions upon the steam-cultivator. Before I came into Bedfordshire I farmed in Buckinghamshire, where I knew the land of Mr. Smith, of Woolston, and, having witnessed the great improvements he subsequently made by his system of steam cultivation, I was induced to order a set of apparatus from you, in the spring of 1858. I have now worked my apparatus for three seasons, and, having done upwards of 2,000 acres of land with it, I am in a position to speak with some confidence as to its success. The effect on the crops has been very vissible each season, but I think the greatest advantage was manifest last harvest. My wheat crop was particularly good, which, after so much wet, I had no right to expect on such heavy land; but I find, after steam cultivating, the water gets down to the drains so much quicker; indeed, I have now dispensed with the furrows altogether; one field, which is rather steep, containing fifty acres, all lies on the flat, and I never saw any water stand upon it, although the land is very stiff.

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* October, 1862. Since this was written, great improvements have been made by Messrs. Fowler, Howard and others.

"My farm, belonging to the Duke of Bedford, contains about 370 acres of arable and 130 acres of grass land. I formerly worked fifteen or sixteen horses, but since I have got my steam cultivator I have managed with seven or eight, and have always been much more forward with my work than when dependent upon my horses; indeed, I should be very sorry to farm this strong hilly land without steam power. I am also enabled to grow a much larger acreage of root crops with a heavier yield.

"The present season proving so excessively wet has prevented me doing as much work as I should have done, still I am very much forwarder with my work than I could have been with fifteen horses to keep, whether able to work or not. I have seventy-five acres of wheat looking remarkably well, some of which would certainly not have been sown had I not had the steam cultivator. I have also put in my tares with the steam cultivator; on account of the wet I sowed them on the stubble before breaking it up; they promise better than those around me put in in the ordinary way. I therefore entirely disagree with people who entertain the notion that a steam cultivator is of little use in such wet seasons: I have found it exactly the reverse. I have also broken up and crossed my wheat stubbles intended for roots and mangolds, and notwithstanding the wet, I have made a good job of them. I usually bout this land in 27-inch ridges, as I think it lies drier and sweeter for the winter, but the backwardness of this season has prevented me. My clover leys I broke up just before harvest, and as usual made a *bastard* fallow of them. From long experience on clay land, I am convinced that this system is a surer mode of securing a good wheat crop than leaving your clover ley down until Michælmas; it also has this advantage, the work of the farm does not fall in so much at one particular time. My tare land was broken up before I commenced the clover leys. Upon my bean stubbles, in an ordinary season, I use my steam cultivator only once, merely harrowing once before and once after the drill. Last year I cultivated 60 acres of bean stubble in this way, upon which I had most excellent crops of wheat. I kept an accurate account of the cost of preparing this land by steam, and found that for labor, fuel, &c., it was exactly 4s. 7d. per acre.

"I have no interest whatever in extending the use of the steam cultivator; but feeling obliged to Mr. Smith and yourself for enabling me to cultivate my own land cheaper and better, I have thrown open my farm to all comers, and, in addition to many from distant counties, it has afforded me pleasure to find some of my neighbors, good practical farmers, following my example; for when I commenced, very few thought I was acting wisely in making so great an outlay in what they termed 'an experiment.'

"In Mr. Dring's letter I notice he says that he finds setting down to a large piece is a mistake; I think it is a mistake to set down to small pieces. I have one field of 36 acres, which I break up without going to the field at all: I put the engine and windlass in an adjoining field, and finish headlands, and all without shifting either engine or windlass. I have another field of fifty acres, in which I have dug a pond at one end, and I set the engine and windlass against the pond, and cultivate the whole without shifting or requiring a horse to fetch water. I sometimes dam up a drain or ditch, and obtain water in that way, for in a wet season water-carting is a great nuisance. I have increased the length of my ropes to enable me to do these large fields; I expected it would take more power, but I don't find it makes much difference to my engine, which is one of Clayton and Shuttleworth's 8-horse double cylinder. I was always told, 'Don't get too much rope out, you will want so much more power.' I am no engineer, and cannot go into the reasons, but I find from experience that the length of rope makes very little difference to my engine.

"As before stated, I have now done with the steam cultivator upwards of 2,000 acres of land, and my rope, although the worse for wear, is still in working order; the other portion of the apparatus is very little the worse for wear. I am convinced, that if people will attend to the coiling of the rope, and exercise moderate care, the rope will last for years. I am sure the expense of keeping the whole in repair is not nearly so much as the repairs of a steam threshing-machine.

"I prefer the engine and windlass separate, as they are more easily moved from field to field, and along bad roads, than the combined engine and windlass I had on trial.

"I don't think much will be done in letting out steam cultivators, as the expense and trouble of haulage is so much greater than with threshing-machines; I speak from experience, as I have let out both, but have given over letting out my steam cultivator; indeed, I have ninety days' work a year for it on my own farm.

"I am, gentlemen, yours truly,

"WILLIAM PIKE."

"Messrs. J. & F. Howard, Bedford."

THE TEST OF OUR STILL BACKWARD CONDITION IN AGRICULTURE, AND THE NECESSITY FOR ITS IMPROVEMENT.

According to our best calculators, the average gross available agricultural produce Britain is barely £3 15s., or less than four rents per acre. Our arable and pastoral available acres may be set down at sixty millions.

Our population is thirty millions. We don't produce enough to feed them and their animals, and, therefore, they not only consume the produce of two acres per head, but are obliged to consume, at least, another acre per head of foreign produce.

Let us test this calculation by an unerring proof.

350 convicts in our City of London Prison, at Halloway, consume weekly 2s. 3d. worth of food, or by the year	£5 17 0
Clothing per week, 4d	0 17 4
Paupers in our East London Union consume weekly 3s. 8¼d. worth of food, or by the year	9 11 9
Clothing, per week, 3¼d	

So, putting the pauper and the convict together, each would consume £7. 15s. 4¼d., or more than the produce of two acres. How many acres would an alderman of the city of London require?

It really is a humiliating fact that we are unable, or rather unwilling, to feed our own people; for my return per acre, on my own poor farm, is more than three times the average of the kingdom. Therefore, I know we could feed our people if we choose to invest enough of capital and intelligence, both as landlords and tenants.

SPIRITED INSTANCES OF LARGE BUT SUCCESSFUL INVESTMENTS.

A friend of mine in Norfolk, who had farmed 1,200 acres of poor light land for some twenty-five years, told me the other day that he had expended £70,000 in oil cake and £50,000 in artificial manure during his occupation. This would be £100 per acre over the whole farm—pretty well, as a tenant's investment; and we can hardly be surprised that his once poor rabbit-warren land has now become highly fertile, profitable to the tenant, and producing a largely-increased rental to the landlord.

But has the landlord done nothing in this matter? Oh yes! He has given hope and security to his tenant by a long and by a renewed lease. He has retained a good farmer on his estate, and sees, in the rising generation of that farm, young men brought up to a high and intelligent culture as a system.

A foreigner was, the other day, much astonished to see a farm-house erected by the landlord, at a cost of £4,000, for the son of this farmer who also farms largely.

If the tenant has found and raised capital enough to increase the live stock and manure the soil, the landlord has been wise enough to provide the necessary accommodation and shelter for them. I will give also a spirited instance of recent judicious improvement on the part of a landlord. A merchant who had realized a fortune in our colonies, and understood sheep, purchased an estate of 4,000 acres, in a county N. W. of London, for which he paid some £130,000 or £140,000. It was a noble property, but, like many such, neglected, unimproved, and consequently low rented. The land, a rich stiff clay, on the banks of the Thames, but undrained, and consequently unprofitable. Most of it was in pasture The owner is draining the whole of it four feet deep, eighteen feet apart, and when I visited the property a heavy stream of water was flowing from the aggregated drains—all top, or rain water. The result may be easily anticipated; the fine Lincoln sheep, which now thrive upon it, give evidence of its altered condition, and will pay a doubled rental. The same gentleman has thrown down the crooked fences, trimmed those that remained, improved the roads and buildings, and deepened the cultivation on the arable by steam power; in other words, the rental will be £8,000 per annum instead of £4,000. The whole drainage will be completed in three years, at an expense of £30,000, or something over £7 per acre; probably not less than £50,000 will be the total investment in improvements. The increase of roots and winter food by this operation is already surprising.

There is nothing in our history more contemptible in the eyes of a commercial man than the frequent and futile attempts of our governors and legislators to fix the value of commodities, whether by bounties or protection. Such attempts have invariably failed, as will be seen by the fluctuating prices and quantities of corn exported and imported, of which I annex tables:—

FLUCTUATION IN THE IMPERIAL AVERAGE PRICE OF WHEAT, ANNUALLY, FROM 1641 TO 1860.

Year.	Price per qr.	Year.	Price per qr.	Year.	Price per qr.
1641	57*s.*	1667	32*s.*	1693	60*s.*
1642	60	1668	36	1694	57
1643	60	1669	40	1695	47
1644	61	1670	37	1696	63
1645	51	1671	38	1697	54
1646	43	1672	37	1698	61
1647	66	1673	42	1699	57
1648	76	1674	61	1700	36
1649	71	1675	58	1701	34
1650	68	1676	34	1702	26
1651	65	1677	38	1703	32
1652	44	1678	51	1704	42
1653	31	1679	54	1705	27
1654	23	1680	40	1706	23
1655	30	1681	41	1707	25
1656	38	1682	39	1708	37
1657	42	1683	36	1709	70
1658	58	1684	39	1710	69
1659	59	1685	41	1711	48
1660	50	1686	30	1712	41
1661	62	1687	23	1713	45
1662	66	1688	41	1714	44
1663	51	1689	27	1715	38
1664	36	1690	31	1716	42
665	44	1691	30	1717	40
666	32	1692	41	1718	34

FLUCTUATION IN THE IMPERIAL AVERAGE PRICE OF WHEAT—*Continued.*

Year.	Price per qr.	Year.	Price per qr.	Year.	Price per qr.
1719	31*s*.	1767	48*s*.	1814	75*s*.
1720	33	1768	54	1815	66
1721	33	1769	41	1816	79
1722	32	1770	44	1817	97
1723	31	1771	47	1818	86
1724	33	1772	51	1819	75
1725	43	1773	51	1820	68
1726	41	1774	53	1821	56
1727	38	1775	49	1822	45
1728	48	1776	38	1823	54
1729	42	1777	46	1824	64
1730	32	1778	42	1825	69
1731	29	1779	34	1826	59
1732	24	1780	36	1827	59
1733	25	1781	45	1828	61
1734	31	1782	48	1829	66
1735	38	1783	53	1830	64
1736	36	1784	49	1831	67
1737	34	1785	52	1832	59
1738	31	1786	39	1833	53
1739	34	1787	41	1834	46
1740	45	1788	45	1835	40
1741	42	1789	51	1836	49
1742	30	1790	55	1837	56
1743	22	1791	49	1838	65
1744	22	1792	43	1839	71
1745	25	1793	49	1840	67
1746	35	1794	52	1841	65
1747	31	1795	75	1842	58
1748	33	1796	79	1843	50
1749	33	1797	54	1844	51
1750	29	1798	52	1845	51
1751	34	1799	99	1846	55
1752	37	1800	114	1847	70
1753	40	1801	120	1848	51
1754	31	1802	70	1849	45
1755	30	1803	59	1850	41
1756	40	1804	62	1851	39
1757	54	1805	90	1852	41
1758	44	1806	79	1853	53
1759	35	1807	76	1854	73
1760	33	1808	82	1855	75
1761	27	1809	98	1856	69
1762	35	1810	107	1857	57
1763	36	1811	95	1858	44
1764	42	1812	127	1859	44
1765	48	1813	110	1860	53
1766	43				

IMPORT AND EXPORT OF FOREIGN WHEAT AND FLOUR.

Statement of the Total Quantities of Wheat and Wheat Flour Imported into and Exported from Great Britain in each Year, from 1697 to 1846.

Years.	Imported.	Exported.	Years.	Imported.	Exported.
	Quarters.	Quarters.		Quarters.	Quarters
1697	400	14,698	1756	5	102,752
1698	1,689	6,886	1757	141,562	11,545
1699	486	557	1758	20,353	9,234
1700	5	49,057	1759	162	227,641
1701	1	98,324	1760	3	393,614
1702	....	90,230	1761	....	441,956
1703	50	106,615	1762	56	295,385
1704	2	90,314	1763	72	429,538
1705	....	96,185	1764	1	396,857
1706	77	188,332	1765	104,547	167,126
1707	....	174,155	1766	11,020	164,939
1708	86	83,969	1767	495,905	5,071
1709	1,552	71,618	1768	349,268	7,433
1710	400	16,607	1769	4,378	49,892
1711	....	80,941	1770	34	75,449
1712	....	148,539	1771	2,510	10,089
1713	....	179,969	1772	25,474	6,959
1714	16	180,665	1773	56,857	7,637
1715	....	173,237	1774	289,149	15,928
1716	....	75,876	1775	560,988	91,037
1717	....	25,637	1776	20,578	210,664
1718	....	74,381	1777	233,323	87,686
1719	20	130,533	1778	106,394	141,070
1720	....	84,343	1779	5,039	222,261
1721	....	82,748	1780	3,915	224,059
1722	....	178,915	1781	159,866	103,021
1723	....	158,082	1782	80,695	145,152
1724	148	247,162	1783	584,183	51,945
1725	12	211,175	1784	216,947	89,288
1726	....	143,626	1785	110,863	132,685
1727	....	31,030	1786	51,463	205,466
1728	74,574	3,935	1787	59,339	120,536
1729	40,315	18,993	1788	148,710	82,971
1730	76	94,530	1789	112,656	140,014
1731	4	130,650	1790	222,577	30,892
1732	....	202,612	1791	469,056	70,626
1733	7	427,425	1792	22,417	300,278
1734	7	498,747	1793	490,398	76,86
1735	9	155,280	1794	327,902	155,04
1736	18	118,218	1795	313,793	18,83
1737	32	466,671	1796	879,200	24,67
1738	3	588,284	1797	461,767	54,52
1739	23	285,492	1798	396,721	59,78
1740	5,469	54,391	1799	463,185	39,36
1741	7,540	45,417	1800	1,264,520	22,01
1742	1	295,698	1801	1,424,765	28,40
1743	3	375,979	1802	647,663	149,30
1744	2	234,274	1803	373,725	76,58
1745	8	325,340	1804	461,140	63,07
1746	....	131,105	1805	920,834	77,95
1747	....	270,491	1806	310,342	29,56
1748	6	545,240	1807	404,946	25,11
1749	382	631,007	1808	84,889	98,00
1750	280	950,483	1809	455,987	31,27
1751	3	662,957	1810	1,567,126	75,78
1752	....	430,117	1811	336,131	97,76
1753	....	300,754	1812	290,710	46,32
1754	201	356,781	1813	559,000	133,44
1755	....	237,466	1814	852,567	111,47

IMPORT AND EXPORT OF FOREIGN WHEAT AND FLOUR—*Continued.*

Years.	Imported.	Exported.	Years.	Imported.	Exported.
	Quarters.	Quarters.		Quarters.	Quarters.
1815	194,931	227,947	1831	2,310,340	65,875
1816	210,861	121,611	1832	681,765	289,558
1817	1,030,830	317,534	1833	322,256	96,222
1818	1,586,031	58,668	1834	201,982	159,482
1819	471,607	44,689	1835	89,035	134,076
1820	591,732	94,657	1836	264,400	256,978
1821	137,684	199,846	1837	575,027	308,420
1822	47,598	160,499	1838	1,380,817	158,621
1823	23,951	145,751	1839	2,852,398	42,512
1824	85,183	61,680	1840	2,352,205	87,242
1825	391,588	38,796	1841	2,691,555	30,390
1826	582,276	20,054	1842	2,916,835	175,958
1827	306,615	57,323	1843	1,064,942	90,679
1828	757,716	76,489	1844	1,379,261	76,205
1829	1,670,602	75,097	1845	1,142,927	59,841
1830	1,676,034	37,149	1846	2,351,908	132,758

Statement of the Total Quantities of Wheat and of other kinds of Grain, and Wheat and other kinds of Meal and Flour, Imported into the United Kingdom from various countries, from 1845 to 1859.

Years.	Quarters.	Years.	Quarters.	Years.	Quarters.
1845	2,429,916	1851	9,618,026	1856	9,339,425
1846	4,752,174	1852	7,746,669	1857	9,169,180
1847	11,912,864	1853	10,173,135	1858	11,293,705
1848	7,528,472	1854	7,909,544	1859	10,270,774
1849	10,669,661	1855	6,278,813	1860	14,173,300
1850	9,019,590				

THE FUTURE OF AGRICULTURE—STEAM.

It is impossible to overrate the enormous impetus given to every industrial and, indeed, to every mental occupation, by the invention of steam-power. Some of my views on this subject having been already laid before you in my paper read last year, I will not recapitulate them.

To withdraw steam power from us would be to plunge this country into ignorance, poverty, and disorganization. Agriculture is only on the threshold of the use of steam power. She has neither cheapened her productions, nor supplied the wants of her customers. It is no exaggeration to expect that every farm of 100 acres will give employment to four horses of steam power. When this takes place, a large area of land used to feed our horses will be set free for the production of human food. I also venture to predict that great commercial companies will be formed, who will purchase estates, parcel them out with topographical economy and connect them with the towns and cities, whose sewage they will economize. We shall then see our agricultural engines gliding along a line of rails from farm to farm and city to city, drawing the produce to market—cultivating the farm.

To see the powerful monster drawn by horses along a common road is an insult to mechanical common sense, and, could the engine speak, would receive his indignant condemnation. When the locomotive was invented, somebody found means to expend £300,000,000 to make a suitable road for it, and somebody will, some day, do the same for steam in agriculture.

The future of British agriculture may be said to rest upon a sufficient use of that cheap and untiring power which has given such an enormous development to almost every branch of our national industry except agriculture. Steam, whether for cultivation or for the manipulations necessary in a well-conducted homestead, for draining the swamps and irrigating the hills—and, above all, for applying town sewage to our pastures, green crops, and root crops, will become the sheet anchor of British agriculture; and it is by this economy that the British farmer will be strengthened in his competition with other corn-producing countries. That great man, Baron Liebig, has revealed to us the mysteries of our subsoil—that subsoil into which the British plow has never yet penetrated. His researches raise a doubt whether it is possible to manure the subsoil through the cultivated top soil; if so, which I believe, how all-important it must be to bring the manure, the air, and the subsoil into immediate contact and admixture with the surface soil! But in any case, let us seek in our subsoil, by means of steam, that treasure which the old farmer told his sons to dig for.

PUBLIC COMPANIES FOR IMPROVING AGRICULTURE.

Assuming and believing that great and comprehensive improvements in agriculture will originate with public companies, I prognosticate that a combined system of irrigation—town-sewage irrigation—and railroad transit must form an important feature of any great district operation. The principles of drainage, steam cultivation, covered buildings, steam machinery, &c., so well understood by our agricultural engineers and surveyors, would naturally form a portion of every such improvement. "But," said a farming friend of mine, as we discussed this question of connecting farms and towns by rail, "how can you expect to do this? Mr. So-and-So would not listen to such a proposition, and his landlord would not like his farm altered and cut about." I reply, there is no cure for prejudice like a public company and an Act of Parliament, at this very moment, regardless of affections and prejudices in favor of old residence and old customs, our new railway companies are, by Acts of Parliament, leveling whole streets and squares of houses, overlapping, undermining, destroying, and reconstructing, with a hard-heartedness yet unknown to British landholders and British tenants. I hope the time is fast approaching when great associated companies of city merchants and rich agriculturists will expend enormous sums in the purchase and reconstruction of estates, making them subservient to the one grand object of an economical use of steam power for almost every farming operation, including sewage irrigation. We shall then not have the mortification to know that it is possible to carry coals at three farthings a ton per mile, at twenty miles per hour, on a railway (formed at an enormous cost, and still paying Consols interest to its shareholders), while our farm produce on the common road costs us eight-pence per ton per mile, and crawls along at a snail's pace.

When estates and farmeries have been so improved by public companies, farmers will be found willing to pay a doubled or tripled rental, provided they see that such increased rent only represents a fair interest on the necessary improvements; and such estates or portions of them would readily find purchasers. We all know that farmers like to hold under public bodies (such as charities, &c.), because their tenure is more secure, and they are more free from personal or political interference or caprice than when holding under a single individual.

I have no doubt that Parliament will, some day, so facilitate the registration and transference or exchange of lands, that public companies may be found to deal with land improvements. It seems odd, that while hundreds of millions of our capital flow into almost every other channel—British or foreign—agriculture has not been dealt with, except lately, on a limited but beneficial scale, by the "Land Drainage" and the "Land Improvement" Companies.

When I suggest public companies, I mean that they should do, on a large scale and with immense resources, that which it would be impossible for individuals to accomplish; and, having made all necessary improvements, sell or let the various farms so improved.

LAND DRAINING.

It would be an insult to this Club to enter into details on this now well-understood subject. Its influence on the quality and quantity of the food of the people is, over a large area, enormous; but still non-drainage is the rule, and drainage the exception. In this respect there is a grand future for agricultural improvement.

Land drainage was practised in Essex and Suffolk one hundred and twenty years ago, on hard chalky clays, and mixed or friable soils, and no doubt greatly increased the produce and reputation of those counties as grain producers. Strange, however, to say, it is hard to make farmers believe that in the tenacious (bird-lime like) collapsing clays, drainage is any use, and there is consequently an enormous extent of such soils undrained in Essex and elsewhere. It is easy to understand that this prejudice arose from the impossibility of using with advantage in such soils bushes or straw, the only draining materials formerly in use—these butter-like soils collapsing and stopping such drains; but, now that we have tileries for making pipes or tubes, no such danger need be apprehended, and I hope our friends will soon give up their prejudices, and so fill their pockets.

Honorable mention should be made of the names of Elkington, Smith of Deanston, Josiah Parkes, Bailey Denton, and Clutterbuck, in connection with the science of this art. Scotland was seventy years behind Essex and Suffolk in this matter of drainage; but then our Scotch friends did it in earnest, and have connected with it deep cultivation and subsoil cultivation, and in this respect are in advance of English agriculturists.

Scotland owes to James Smith, of Deanston, her drainage and deeper cultivation, and an early appreciation of the value of town sewage. I had the pleasure to know this useful man, and his views agreed with my own, that we were still only on the threshold of agricultural perfection.

RIVER REFORM,

so ably descanted on by Mr. J. Algernon Clarke, will surely soon make its way. In former times, when our daily bread depended on the action of our water-mills, the law was strained in favor of the miller, who may be said to have occasionally, and not unfrequently, used the adjoining lands as reservoirs of water for the river, to the ruin or injury of the said lands; but, now that mighty steam has insured to us at all seasons a comfortable loaf, a change is taking place, and the judges have recently, in a most important issue, ruled that the unseen water in the land is the property of the landholder, and that, even if sinking wells and using the water should dry up a river by diverting subterraneously its waters, no action would lie. Open ditches, or rivulets leading to a river, must, however, be still respected.

This decision must lead to most important results, enabling landowners to dry or lower the level of the water in their soil, and use it for irrigation if desirable.

TENANT-RIGHT AND LEASES.

The history of the past shows that the former violent fluctuations in prices acted as a bar to security of tenure by lease; no landlord or tenant believed in an average of prices. Without going into the question of Free Trade, our Tithe Commutation Act has afforded us something like an approximation of averages over a given period. Let us hope that the words "average 56*s* per quarter for wheats" may give confidence in leases; it is certain that without leases no tenant will invest his capital in improvements, unless secured a tenant-right for such investments.

The Scotch nineteen years' lease appears to ensure a good improving tenantry, and a large increase of rental at the end of the term.

In Essex, a man without a lease may expend £20 an acre in drainage, chalking, and other improvements, and if he die, and the farm be given up, not a shilling of it would come to his executors.

THE LABOR QUESTION.

Labor is silently, but surely, slipping away from agriculture to the better food and higher pay of other industrial occupations.

The parliamentary and excursion trains have provided a quick and cheap transit, and so have our coasting steamers. The new implemental requirements of agriculture, both British and foreign, have absorbed many a farm laborer; and the almost unobserved but regular transmission of the same class to distant colonies, by the Emigration Commissioners, also tells upon the farmer's labor store.

This is well for the country, for necessity is mother of invention, and agriculture may be more readily impelled, by need than by persuasion, to resort to that mighty power which has enriched our manufacturers.

Experience has taught us that, as farm laborers come in contact with manufacturing towns or cities, they can only be retained on the farm by an increase of wages; our southern and non-manufacturing districts will not, therefore, long retain cheap laborers, especially now that the Penny Press makes them acquainted with the money advantages of an employment elsewhere.

THE LABOURER'S CONDITION AND COTTAGE.

The labourer being the most important tool in agriculture, it is desirable that he should be sharp and well polished, as well as strong. This has not hitherto been sufficiently attended to, but it must very soon be. The schools now gradually erecting will enable the rising generation to read the instructions for cleansing, repairing, and managing the steam-engines which agriculture must put up. They will also be able to read their Bible, and their Penny Newspaper; probably hereafter they may be not thought unworthy of Local Libraries and Literary Institutions, also Baths and Wash-houses.

The extension or abolition of the Law of Settlement will destroy the old selfish and unfeeling practice of foisting on your neighbor, in his old age or affliction, the man whose labors, in his youthful vigor, contributed to your wealth. Landlords are beginning to believe that the indecent propinquity of crowded bed-rooms, added to the evil sanitary results of insufficient house room, tell indirectly; but most unfavourably, on their pecuniary interests. The profit from good labourers' cottages must always be, in some degree, indirect.

MEAT-MAKING.

Future advances in agriculture will, I venture to predict, be based upon and identified with the production of a much larger acreable quantity of meat than we at present produce. The constant increasing prices of meat plainly testify that demand is exceeding supply, and that foreign nations cannot make up the deficiency. Our acreable area being limited by the ocean, the only means of doing this must be the extensive use of purchased food and manures, and by the economy of the sewage of our towns. The consequence of this improved system will be felt in our grain crops; for the more meat you produce, the more manure you make, and, consequently, the more corn per acre you will grow on the arable portion. This production of more meat will necessitate a better knowledge of the mode of producing it, having regard to a profitable result.

THE FUTURE CHARACTER OF FARM RESIDENCES AND FARMERIES.

It is notorious that, if you are to have for your tenants men of capital and intelligence, their residences must be suitable to their intelligence and means. I know practically, and it is notorious, that on many of our large south country farms, the residences are totally unfit for such a class of men, who, I believe, would willingly pay an increased rental for such necessary accommodation.

The landlords of such farmers are therefore obliged to put up with men of inferior capital and intelligence.

Surely a farmer of 700 acres, with a capital of £10,000, should not be less favourably housed than a merchant or a trader.

"BURN YOUR CLAY INTO BRICKDUST,"

will be a motto with every heavy-land farmer. I know one who for years has continued burning a clay hill. It provides him with healthy bedding for his stock, and with alkalies for his root crops. It permits him to consume his straw in food instead of wasting it under foot. It renders his land friable and more economical to work; and it has thus largely increased his green crops and profits. This is also my experience in the matter.

WITH REGARD TO OUR HOMESTEADS OR FARMERIES,

the time will come when we shall see them like factories or railway stations: warmed in cold weather, lighted with gas, the manure well cared for—unwashed, and with its full powers preserved. These things are all necessary to the cheap and abundant production of meat and bread for the British people. It is of no use to cry out, "Where is the capital to come from?" It will be found, as it has been found, when the requirement of the times and the increasing intelligence of landlords and farmers shall have given the subject due consideration.

Let the system be introduced by those who are able and willing, and let it be found to be profitable, and then the rising generation will grow up with its acceptance, free from the doubts and disbeliefs of their forefathers, who had not had practical evidence of its advantages.

IN CONCLUSION:

It is a great mistake to suppose that farmers are naturally more prejudiced than other men. It must be remembered that it has been their misfortune, and not their fault, that the difficulty of intercourse prevented those examinations and comparisons which the railroads and literature of recent times have permitted them to make. That there exists a most creditable desire to avail of such opportunities has been abundantly proved by their overwhelming attendance at the great annual and other exhibitions of stock and machinery.

My object in reading this paper has been, not to find fault but to stimulate. I know the difficulties of agriculture,—I know that we cannot control the seasons, but we may, by improvements, so moderate their ill effects as to avoid those famines and sufferings which in less favored times, afflicted this happy country. For the future let agriculture assume more of the manufacturing character; and let the question be, not what it costs, but what it will pay, to effect agricultural improvement.

EVENTS HAVING A PROGRESSIVE INFLUENCE ON BRITISH AGRICULTURE.

Societies for the Promotion of Agriculture.

1777 The Bath and West of England Agricultural Society.

1784 The Highland Society.

1793 The Board of Agriculture (incorporated) was established by Sir John Sinclair, and had Arthur Young for its Secretary.

1798 The Smithfield Club.

Annals of agriculture commenced by Arthur Young, and continued until 1808.

The two great Agricultural fetes of this period (the sheep-shearings at Holkham and Woburn, at which hundreds of the most eminent of the kingdom were annually assembled) were also serviceable in stimulating the national taste in favour of agriculture.

1838 The Royal Agricultural Society of England.

1841 The Do. Do. of Ireland.

1843 The London Central Farmers' Club.

The first Farmers' Club.

The gradual establishment of Local Farmers' Clubs and County Agricultural Societies.

1845 The Royal Agricultural College, Cirencester.

Charities.

1860 The Agricultural Benevolent Institution, 55, Charing Cross.

New Plants, previously unknown in Britain.

1524 Hops from the Netherlands.
1645 Clover Pratensæ.
1700 Potatoes introduced into England by Sir Walter Raleigh.
A government premium given as an encouragement to their cultivation,—first in Scotland in 1739, and became general there in 1760 to 1780.
1700 to 1732 Italian Rye Grass (Scotland).
1707 Clover Perenneum.
Ditto Repens. In Scotland, where heath is removed and *lime* is applied, it springs up spontaneously.
1730 White Turnips (Norfolk Whites) used by Lord Townshend.
1740 Broad Clover known in Scotland.
1781 Swedes grown in East Lothian. Garden Turnips were known in the reign of Henry VIII.
1810 Mangel Wurzel. Introduction due to Dr. Lettsom, most important as a root for heavy clays.
Sainfroin and Lucerne followed the introduction of Clover.
1821 Clover Incarnatum. Ellman.
1834 Ditto Hybridum. W. Stephens.

Artificial Manures.

1820 to 1828 Rape Dust, known in Scotland as a valuable manure.
1821 Bones used by Mr. Watson of Keillor. Mr. Stevenson, of the *North British Agriculturist*, says that they were known to be agriculturally useful at the end of the last century.
1829 Half cwt. Guano brought from Liverpool to Scotland, and sold at 6*d.* per lb.
1831 Three cwt. Guano brought
1841 Superphosphate of Lime.
1841 and 1842 Guano first used in quantity. Some idea may be formed of the quantity now used, when it is stated in the *Times* of this day, 2nd Feb., 1861, that Messrs. Gibbs and Co. paid last year at Liverpool £7,000 warehouse rent, being at the rate of only 3*d.* per ton, with the addition of dock dues.
Marl used before the Roman Invasion.
Woolen Rags.
Blood and Offal.

Ground Coprolites.
Fish Manure.
Star Fish, Sprats, and Mussels.

Artificial Foods.

Linseed.
Linseed Cakes.
Rape do.
Nut do.
Cotton-seed Cakes. I first used some about 1856-7.
Locust Beans.
Indian Corn, Rice, Dara Lentils, Egyptian Beans, Dates, and a variety of other foreign productions.

Legislation and Corporations.

1825 The Emigration Commission.
1834 The New Poor Law.
1836 The Tithe Commutation Act.
1840 The Penny Post—Sir Rowland Hill.
1841 The Copyhold Enfranchisement Act.
1841 Free importation of foreign animals.
1844 The Landowners' Land Drainage and Inclosure Company.
1845 Inclosure Commission.
1846 Government Drainage Loans.

The first act was passed in August, 1846, and a grant for England and Scotland, for a period of twenty-two years, at 6½ per cent., was for £2,000,000, and for Ireland £1,000,000. The demand for Scotland was very great, as much as £40,000 by a single proprietor; but early in the session of 1847 an act was passed limiting the amount to any one proprietor to £10,000. In 1849 the whole money was applied for and granted, and an act passed for enabling companies or private parties to advance money. In 1850 another act was passed, making an additional grant, for England and Scotland, of £2,000,000, and for Ireland of £200,000, but limiting the sum to any one applicant to £5,000, including previous grants—a pretty clear proof of the anxiety for improvement by drainage.

1847 An act passed for obtaining outfalls.
1847 Free importation of foreign corn.
1848 The General Board of Health.
1849 The General Land Drainage and Improvement Company.
1853 The Lands Improvement Company.

Implemental Inventions.

1710 Winnowing Machine introduced from Holland into Scotland, and publicly denounced from the pulpit.

1740 The Drill. Jethro Tull. (Poor Tull died in the Fleet Prison, where he was confined for debt.)

The Horse Hoe. Ditto.

1786 The Threshing Machine and Fixed Beaters. By Andrew Meikle, (Scotland). One in use sixty years at Clackmannan, at a farm and distillery.

1788 The Dibbling Machine. By the Rev. J. Cooke.

1827 The Reaping Machine. By the Rev. Patrick Bell (Scotland), who is still living.

1851 The Americanized Bell's Reapers. Made by McCormick & Hussey. (First tried on my farm.)

1841 The first Agricultural Portable Steam-engine. Invented and made by Davies, of Birmingham.

The Grass-mowing Machine. Introduced from America.

Pipe-making Machines. Clayton and others.

First Draining Tilery established.

Fowler's Steam-draining Plough.

Fowler's Steam-cultivating Plough. (Used on my farm in 1856.)

Smith's (of Woolston) System of Steam Cultivation.

Howard's do do

Literary Events.

The Art of Printing.

Caslon's Type Manufacture.

The Printing and Circulation of Agricultural Newspapers and Magazines. Roby's "Farmers' Journal," about 1790.

1534 The first English work on Agriculture was entitled "The Booke of Husbandrie," 100 pages, by Sir Anthony Fitzherbert, Chief Justice of the Common Pleas in the time of Henry VIII.

The second was by Thomas Tusser, an Essex man, born 1527, who farmed at Rivenhall, about six miles from Tiptree.

1740 Jethro Tull. "Five Hundred Points in Husbandry."

Arthur Young (also an Essex man), published his "Tours in England."

1784 "The Annals of Agriculture," commenced by Arthur Young, and continued until 1808.

The Journals of the Highland Society, and of the Royal Agricultural Society of England.

The Works of Robert Brown, Sinclair, Morton, Stephens, Low, Loudon, Huxtable, Smith, Hewitt Davis, Rham and Pusey.

James Caird's valuable Farming Tours.

Agricultural Chemistry.

Sir Humphry Davy, Baron Liebig, Johnston, Playfair, Way, Anderson, Hoffman, Vœlcker.

General Events.

1801 Steam Navigation. First boat built on the Clyde.
Turnpike Roads.
Canals.
1830 Railroads (Manchester and Liverpool).
The Spinning Jenny.
The Mule.
The Power Loom.
The Steam-engine, as applied to Manufactures, Mining, and River and Ocean Navigation.
1837 The Electric Telegraph.

THE PROBABLE VALUE OF SEWAGE MANURE.

To the Editor of the "Mark Lane Express."

Dear Sir,—I am always much *amused* by the talented and witty contributions of your "correspondent,' who, in his "Wednesday with the Royal Agricultural Society," has succeeded admirably in damaging Edwin Chadwick and the sewage manure cause with *those who do not practically understand the question*, and they are "legion."

I have long since arrived at a conviction that it will require many years of hard fighting to carry the cause to a general adoption. Such a conviction is consistent with all previous evidence as to new agricultural practices or inventions, and, therefore, your correspondent will have still many opportunities to delight the disbelievers in liquified application as a successful and paying operation. Four hundred and twelve millions of Chinese (a full half of the world's population) have arrived at an exactly opposite conclusion; and, therefore, they are not in our humiliating position of being unable to produce their daily bread, but to depend on foreigners to supply us. The Chinese population has a greater acreable density than that of England.

Your correspondent's ideas are evidently wrapped in straw. Without that, and the good old-fashioned and well-washed dung-heap, agriculture cannot, according to his view, prosper.

But, dear sir, the straw-litter question is becoming gradually one of other days; and in spite of the once uproarious jollity which exploded when I ventured to advocate the use of straw as a feeding material, there is now more chaff than ever in agriculture, and nothing will do but that pulped roots must be mixed with it, as a source, not of fun, but of profit.

The time is likewise gradually but surely approaching, when the water from our buildings will, instead of washing away the best part of our manures, be stored in tanks or ponds, and be used, with the drainage of our land, for the fertilizing of our grasses.

I admire the ingenious, but negative, skill with which "our correspondent" takes care to avoid "Cocker."

He knows that he dares not trust to the actual facts and figures of calculation in this matter, which is, after all, only a rule-of-three sum, the only means of testing the paying or non-paying of the system.

There is something very disengenuous and unkind in quoting the failure of certain persons who once adopted sewage irrigation. Was that failure caused by or in consequence of pursuing the tubular system?—or was it from other causes quite independent of it? I know it was the latter, and your correspondent might easily have ascertained the fact for himself.

I will not enter upon the larger question of applying town sewage to agricultural purposes. That will make its way some time within the next hundred years, which is not long in the history of a nation. Landlords and farmers will not then see with complacency the residuum of £38,000,000 worth of feeding stuffs, imported from abroad in one year, wasted in our rivers. We have the last twelvemonth paid that sum for man's food. Cannot farmers understand how such an importation applied on the land would have increased their profits? We are now cheerfully paying £4 to £7 per acre for draining water from the soil. Why, then, should we grudge to invest that sum for putting sewage on the land?

In my case, the key to my success is the power of producing greatly increased quantities of hay and grass from a small area, thus setting free much land for corn, and enabling me to feed a much larger acreable quantity of stock with *the produce of the farm.*

The cost of putting on a rain-fall of one inch, or 100 tons per acre, is, in my case, about 5*s*. Will any man venture to say that such an application *at the right time* will not greatly increase his grass crop?—especially when that rain-fall is seasoned in suitable proportions with the mixed excrements from our animals, or with guano or other artificial manures.

Before irrigation I was always short of green crops and hay. Now I have both in abundance, and hay to sell.

In Conclusion, if "our correspondent" desires to serve agriculture, let him advocate the application to the soil of those vast manurial treasures that now flow down our sewers aud poison our rivers.

I am, dear sir, yours truly,

J. J. MECHI.

Tiptree Hall Kelvedon, Essex,
May 24th, 1861.

SUGGESTIONS FOR INSTITUTING COMPARATIVE EXPERIMENTS ON DEEP PLOWING.

Most agriculturists will admit that deep tillage has, in general, a beneficial effect upon vegetation; that in the case of some kinds of plants it is even indispensably necessary for their growth and prosperity; as, for instance, where nurseries are to be established and sugar beets are grown; but as to the necessity and advantage of a deep tillage of the soil for cereals, pulse, clover, esparset, etc., opinions vary. The difference of opinion in regard to this point is the chief reason why deep tillage of the soil has not been adopted generally. With the general question of deep plowing there are connected some special questions, such as—

1. To what depth does the deeper tillage of the soil still exercise a perceptible influence upon vegetation? and

2. Does the same prove profitable for every species of plants, and does the increase of the crops cover the increase of the expenses?

In the abstract, the limit of deep tillage will doubtless be supposed to be where a deeper tillage of the soil does not produce any perceptible favorable effect upon the plant grown; but the practical farmer will draw this limiting line closer, namely, where the increased cost of deep tillage is not counter-balanced by the increase of the crops.

The thorough and reliable determination of these questions will be no easy task; for it is apparent at once that it requires a double series of experiments. Practical husbandmen know well that rarely anything can be accomplished without trouble; they are accustomed to it, and therefore I do not apprehend that they will disregard the question because its solution is troublesome. It will solely depend upon this, whether it is a question of general interest and of such importance as to render it necessary to seek for a scientific solution, instead of being satisfied with conjectures.

The field of the operations of the practical farmer lies open before the eyes of every observer, and he will rarely envy his colleague whose intelligence and persevering industry are crowned with success, but is rather stimulated thereby to emulation and progress. The market for agricultural products, fortunately, is very extensive, and the producer needs not feel any anxiety as to how he may dispose of useful products, or fear competition. Moreover, the farmer needs not withhold anything as a secret, if he should make a discovery in agriculture, when he may only expect thereby to advance progress in his calling. A progress in agriculture is a furtherance of the material welfare of mankind; and to avail himself of the same in secret, for his individual benefit, and to withhold it from his fellow-men, would be a crime. Every farmer should consider it his duty to assist in providing the most necessary means of subsistence for the steadily multiplying inhabitants of our limited globe. The continually increasing demand for food and clothes may cause a well-founded anxiety to the thinking observer as to how the same shall be satisfied, when the entire arable area of the earth will be in cultivation, and no more new lands can be reclaimed and made productive. First of all, the attention will be directed to an increase of crops on the soil tilled—to a more intense cultivation of the same.

After this digression, we return to our theme—the deep tillage of the soil.

Although it has already been adopted on many intelligently cultivated farms, yea, in pretty extensive districts, especially in the sugar beet regions, and found many zealous advocates, yet it cannot be denied that by far the largest portion of the cultivated soil remains as yet untouched by really deep tillage.

When the advantages and benefits derived from a deep tillage and the increase of the expenses in money and time occasioned thereby shall be reduced to reliable figures, and when it shall be proved to every body by an easy arithmetical calculation how much the average *net* yield of the soil increases by the tillage of the same to a certain depth, either through more abundant crops or through the greater value of the productions, then, and then only, every doubt, every prejudice, and old and endeared customs will be overcome.

The simple husbandman is often charged with disbelief and distrust, which is mostly attributed to his deficiency in science; but we must say in apology for him that many things have frequently been recommended to farmers the trial and application of which did not give the results promised, and thus their money, time and labor were lost.

Further, it seems to be possible that many may have deceived themselves by a certain enthusiastic interest for the good cause, and that those not stimulated by sanguine expectations will wait and see what may become of the thing after the enthusiasm shall have subsided.

Finally, we must yet mention another thing as an excuse for the above-stated gross fault in the practical farmer, namely, those cases in which ambitious vanity to become renowned and conspicuous in the eyes of their brethren may induce them to produce something very nice and fine, without considering whether the value of the production will not be less than its cost.

As I remarked above, the field of the operations of the farmer lies open before every observer, but not the final settlement; and I may, therefore, repeat that the surest way in which that unpleasant distrust may be overcome will be to give an account in the proper form. But the factors for an example of this kind are not given by the dynamometer and chronometer, but must be found through *comparative experiments*, before the correct ratio can be obtained and the result be considered reliable.

Until that period of time when the natural sciences shall have still further advanced, so that they shall have added to the knowledge of the laws of nature yet another series of new discoveries, comparative experiments made on his own fields may still give the farmer noteworthy experiences, if he possesses sufficient perseverance and interest in the cause, in connection with a gift of keen observation.

Those of my colleagues who were present at the meeting of the Central Association of the province of Saxony, held in Stendal, and heard with what modesty a scientific man, celebrated for his works on animal chemistry, admitted that the farmer still has the privilege of carrying material to the temple of scientific knowledge, at which our posterity will have to build for centuries yet, and will deem it expedient to come honestly and openly before the public with practical comparative experiments, although he acknowledges thereby that he has not yet made himself master of those powers of nature, the knowledge of which seems to be generally disseminated. At all events, united efforts will accomplish more than isolated ones, and if our practical experiments are aided by men of science, we may learn by them what would remain obscure in the way of mere experience.

It may be that the question of deep tillage has been determined without my having learned it; but if it is yet undecided, and many of my colleagues should be interested in it, I will state here some suggestions on the management of the experiments, not to fix the method and manner, but have the same taken into consideration and bring about uniformity.

The first series of experiments should principally aim at the determination of the advantages derived from deep tillage of the soil—at the quantity and quality of the crops grown; for instance—

1. How long will one deeper tillage of soil prove beneficial to subsequent crops, and at what intervals must the same be repeated to secure continued success?

2. Is the deep tillage equally beneficial to every cultivated plant, or may a scale be fixed for the kinds known?

3. Does the deep-tilled soil constantly need more or less manure than that which is not tilled so deep, or must the manure possess properties different from those of the common barn-yard manure?

4. What is the proportion of the net profits derived from a more shallow and deeper tillage on soils of the same nature, situation and climatic conditions?

The second series of experiments ought to aim at determining the amounts of labor, time and money required for a deeper tillage of the various arable lands, with regard to the subsoil and situation:

1. It may appear necessary to make an accurate computation of the amounts of labor, time and money required for tilling the soil to the depth of three or four inches (as the minimum depth necessary for the cultivation of a field.)

2. It ought to be determined how much this amount increases wit every inch of a deeper tillage, since it is a matter of course that th amount of labor and time cannot be calculated according to the rate of the inches of the depth; so that, if the power or labor required for three inches tillage was designated as p, the power required for nine inches tillage might simply be expressed by 3 p; for it would require more than three times as much power to perform this latter labor.

3. The results from No. 2 on the various arable lands, and in level and hilly sites, should be compared.

4. The expenses, &c., when the subsoils are different, or when there are deposits from washings, or large rocks, should be computed.

It needs hardly be mentioned that it would be desirable that every one who undertakes such comparative experiments should fully carry out at least one series of experiments; make the experimental parcels not too small—at least from one-half to one acre; arrange them as closely as possible parallel to each other, on soil of the same nature and situation, and endeavor to obtain the greatest possible uniformity in regard to the required teams and the manual labor, in order that the comparative review of the whole may be facilitated, and no other influences but those founded upon the experiments themselves be brought into the calculation, which might be overlooked, and the results thus be rendered unreliable.

Four acres, side by side of each other, of similar soil, may surely be selected at many places. On such an area the uncontrollable influences would in most cases be equal, and might therefore be omitted in the computation. Such an area may also be easily watched and properly tended; and further, the power and time required for the tillage may be measured, the seed of the same kind and the same quality and quantity be apportioned, and the results be determined at harvest time with accuracy.

ON DEVELOPMENT OF THE CHEST IN CATTLE,

ACCORDING TO BAUDEMENT'S EXAMINATIONS.

One of the many advantages derived from properly managed shows of agricultural animals lies in the fact that the same furnish the material and opportunity for comparative observations which are indispensably necessary (if we will not found our doctrine and our practice upon words), and which are difficult to make if many animals suitable for the comparison are not placed beside each other at the same time.

One of the most thorough and best works of this kind known to me is an investigation by Emil Baudement on the development of the chest in cattle. That the results of his investigations have not been published in our agricultural periodicals is perhaps owing to their having been given in a French periodical not very extensively known (Annales du Conservatoire Imperiale des Arts et Metiers). The subject of Baudement's investigations has also engaged my attention for several years. By my own observations I have arrived at essentially the same results and conclusions, and I now undertake to state the same.

Baudement has measured and weighed alive 102 oxen which had been awarded premiums at the exhibitions of fat cattle at Poissy, and after they were butchered ascertained the proportion of the individual parts by weight. One-half of the oxen were of native French races; the other half consisted, for the smaller portion, of English races, and for the larger portion of crosses between the two races mentioned. The tables prepared by the author contain the age of the animals, the circumference of the chest according to three measurements, the heighth to the withers, the length from the back of the head to the caudal vertebra, the weight of the lungs, the heart, the live weight, the dead weight of the four quarters, also the proportion of the dead weight to 100 lbs. of the live weight, the weight of the tallow, and the proportional weight of the lungs to 100 lbs. of the live weight. Besides, numerous calculations have been made in regard to age, size, race, &c., so that much available material is furnished. Here I will not give all those figures, for they would require too much space, but I will confine myself to an elucidation of the results obtained by his assiduous labors, with which my own observations and views coincide.

The measurements of the circumference of the chest are made in two ways: The one is to measure the circumference of the body close behind the two elbows or in the level which descends perpendicularly upon the axis of the trunk; the other measurment is made in an oblique way (called the Dombasle method), measuring over the withers across the top of the shoulders of the one side, through between the legs close behind the elbow of the other side.

Numerous measurements of the flayed hide after butchering have shown that the *averages of these two measures*—of the straight and oblique measurement—represents most correctly the widest circumference of the chest, of which, as everybody knows, no direct measurement can be made upon the living animal. The measure thus obtained is as nearly as possible equal to that which in the slaughtered and prepared animal shows that place which is widest expanded by respiration. It corresponds to the measurement of the circumference of the human chest at the height of the nipples.

But these two different methods of measurement furnish yet in themselves another interesting point for comparison. The difference between these two measures shows to what degree the chest is conical, to what degree the same becomes narrower behind the shoulders, and thus also, according to our terminology, whether and how much the animal is "girded in."

Before giving the results of the observations and measurements, I have yet to mention two points: That a wide breast, a strong chest, forms an important and influential quality of the animal, is an old experience presenting itself to the observer endeavoring to obtain a clear idea of the animal form. Since a so called scientific presentation of the doctrine on the animal body and its breeding for agricultural purposes was adopted, it became, according to Weckherlin's precedence, customary to put the size of the lungs in direct relative proportion to the circumference of the chest. "A narrow chest, and, *therefore*, small lungs" (see Weckherlin's Animal Production, 231), is set down as a rule in all compends.* It was natural to suppose that such a definite assertion was founded on observations, and it was not to be presumed that it was only a conjecture and a false conclusion.

Thus I was then not a little surprised in finding at first, by the dissection of such animals as actually have a large circumference of the chest, and as we have become somewhat better acquainted with since about ten years, *small* lungs, *i. e.*, small in proportion to those in animals examined by me before, namely: merino sheep and oxen and cows of various native races. Afterwards I read in older reports that Paris butchers and farriers, when they first got animals of English races under their hands, had made the same observation, and were also surprised. Therefore it appears to me a matter of great importance that Baudement, by numerous and methodical observations, has now so indisputably refuted the former erroneous opinion that it will not prevail again, since a clear physiological view could not accede to it. But we have, alas, still a multitude of similar doctrines in the science of animal production, like that on the proportion between the lungs and the chest, which, although they are not based on observations, but solely on presumptions and opinions, still prevail.

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* The newest work of May, "The Neat Cattle," says (p. 364): "The wide chest contains proportionately developed lungs."

Here I have yet to mention one point overlooked by Baudement. If one has a correct idea of the structure of the lungs, as far as it is possible by our present microscopic and other means, it must be apparent to him that the size of the lungs and their weight are by far too rough and clumsy measures to determine thereby, in a comparative way, the inner structure and the functions of this organ. The sum of the surface of all the finest blood vessels and air cells can not be computed, or their variations in individuals or races be compared. Further, the weight of the lungs is an indefinite item, because it is partly conditioned by the contents of the blood vessels which cannot be equalized; thus, because we possess no means of representing the real substance of the lungs without their contents after death which depend more or less on circumstances. Besides it had to be known that, according to observations, the vesicles in the lungs or the air cells are constantly smaller in young animals than in older ones. Nevertheless it is demonstrated that the former opinions as to the relative proportions between the size of the lungs and the width of the chest were erroneous.

This is the more apparent when we consider that *all* experiments instituted by physiologists on the respiratory process do perfectly agree in their results, as far as they have a bearing upon this subject. The respiratory action has been measured directly by the volume of air entering into, and escaping, from the lungs (Hutchinson, Simon, Albers, Fabius· Wintrich, Arnold, and others); the respiratory action has been computed according to the number of times the chest expands and contracts (Herbst, Lustelet, Valentin, Marcet, Mignot, and others); finally, the respiratory action has been measured by the intensity of the chemical process, by the amount of the oxygen absorbed and the carbon exhaled (Spallanzari, Cuvier, Dulong, Regnault, Scharling, and others); all these experiments showed that the action of the lungs decreases during rest, in sleep, while the animal is lying in darkness, or when it is fattened, and that it increases by any slight muscular exertion, in standing, in bright daylight, at any irritation of the nerves and temper. All these phenomena have always been the same in individuals of the same kind, and when kinds were compared with kinds, or even extensive animal groups of the zoological system with others

The result of practical observations do fully harmonize with those of scientific experiments; and it would be useless to prove this here.

In the face of all this, it is hard to understand how a theory could be adopted which is based upon the presumption of a more intense action of the lungs, and hence upon the larger size of the lungs in animals that excel others by their quality of being more easily fed and attaining to relatively larger dimensions of the body. On the contrary, it ought to have been evident that in easily fattening animals respiration is proportionately less active, and if any inference as to the size of the lungs was to be drawn from the respiratory action, smaller lungs should have been presumed, instead of arriving at the false conclusion that large lungs were contained in a wide chest. Exact observation, independent of any theory, has now established the fact that a wide chest may be provided with proportionately small lungs, and thus experience and theory otherwise tenable are brought into harmony.

After these preparatory remarks, I will now state the results of the observations:

1. In general, the development of the chest is a criterion of the weight of the animal; and the width of the chest is proportionate to the ability of the animal to realize the worth of its food.

Observations confirm this opinion, but as to the form, and the live and dead weight of the animals, they show the same to be untenable.

2. As the animal increases in weight (be it in consequence of a more advanced age or of individual fattening quality), the chest and the entire surface expand in proportion. These three points, namely, weight, width of chest and entire surface, are in constant proportion in all periods of development, independent of other dimensions, such as length and height of the trunk; these dimensions do not increase in the same proportion as the circumference of the chest.

3. The increase in volume is proportionate to the circumference of the chest; thus, the *live* weight of the animal may be estimated by the circumference of the chest.

4. But from this process of the development of the chest it follows also that, in comparing the animal body to a cylinder, no strictly geometrical dimensions and forms can be applied, if we compare animals with each other in respect to volume or surface.

5. As to the *dead weight* (of the four quarters) those animals give the more favorable result which are smaller and have shorter limbs, whose chest bone nearly touches the ground, if also the chest is strong, the region around the chest is of a regular cylinder form, without depressions, and especially without being "girded in" behind the shoulders. If fattened, such animals will bring the largest profit on the food consumed.

6. The circumstances conditioning a favorable dead weight, are generally combined with a more developed length of the trunk.

7. The live and dead weights, therefore, are *both* greater, and the animal is of greater value to the *breeder* as well as to the *feeder*, if a large circumference of the chest is combined with a good length of trunk, a regular cylindrical form, a less considerable height, depth of chest-bone, and shortness of the lower parts of the legs to the knee.

8. As a rule, the lungs increase in volume with the circumference of the chest, but the increase of the lungs is in no way proportionate to the development of the circumference of the chest: the development of the lungs is in no relative proportion to the development of the chest. Thus observations do not confirm the general assertion (of Weckherlin and nearly all authors) that the development of the chest constitutes the rate for the development of the lungs; but they show that the development of the exterior volume and of the weight of the lungs is dependent on certain conditions of the vital functions, of size and form, of age and race.

9. In animals of the same live weight, the lungs are the more voluminous the larger the animal.

10. In animals of the same live weight, the lungs are the more voluminous the younger the animal.

11. In animals of nearly the same age, and otherwise of the same condition, usually the *absolute* weight, and constantly the *relative* weight of the lungs are in proportion to the live weight—smaller when the circumference of the chest is larger, and larger when the circumference of the chest is smaller.

12. In smaller and lighter races the lungs, in comparison with those of heavier races, are heavier in proportion to the live weight.

13. In animals of the same race, the relative weight of the lungs is least in those of the greatest live weight, and is greatest in those of the smallest live weight.

14. In races of early maturity, the absolute and relative weights of the lungs are smaller than in those of late maturity. A comparison of the French and German with the better English and Scottish races proves this.

15. From these proportions it follows that those animals have the smallest lungs which excel by their weight, fattening qualities, and early maturity, development of the circumference of the chest, and profitableness.

16. If the functions of the organs are estimated by their development conditioned by the same, we obtain the conviction that the respiratory action is less in animals which excel by their increase in weight; and attain this in a more easy, more rapid, safer, more uniform, and more profitable way. The theory which makes this quality dependent upon a more powerful respiratory action, and this action again on a greater volume of the lungs, is not confirmed by the observation of the facts.

17. All the results of the observations harmonize with those of the physiological experiments on respiration. A comparison of both shows that in all cases in which physiology has proved an increase of the respiratory functions, conditioned by a greater vital power of the organism, or by influences arising from size, age, and weight, the lungs are more fully developed in proportion to the live weight of the animal, and *vice versa*.

18. The peculiarities in respect to the form and usefulness of animals, are conditioned chiefly by the method of feeding and rearing them from their birth, it depends principally upon this to what degree they have, in the earlier period of their lives, been enabled to develop, and this in the way prescribed by the acknowledged laws of the historical development of the animal body, according to which the trunk is first developed and then the limbs.

19. The development tends to the expansion of the trunk and the formation of fat; the reduction of the extremities and the later developed parts of the body is a natural consequence of this tendency in animal development. If this expansion is favored by constantly abundant feeding in youth, and by all the conditions facilitating the formation of fat, then the trunk, as it were, monopolizes the developing functions, the region of the chest expands, and the limbs are developed later; in this way the peculiar forms of the animals of good fattening qualities originate. Then, if the selection of breeders is governed by this tendency, those peculiarities become fixed or constant to a certain degree. On the contrary, if this tendency is not constantly pursued, the width of the chest decreases in the same proportion as the expansion of the trunk is checked, and hence the dimensions of the trunk, the length of the legs, and the volume of the lungs are modified in proportion.

20. Thus, the width of the chest is the criterion for the expansion of the body, in tracing it to its cause.

21. Hence, the width of the chest is a safe criterion for the value of the animal as to its fattening qualities, and shows how it was fed in its youth. Thus, the summary of the whole theme on the development and improvement of the races, and also the whole physiological and economical problem of the breeding of domestic animals is conditioned by the feeding of the young animal.

These conclusions were derived from observations on cattle, but they will hold good also in respect to the other domestic animals. According to the different purposes for which animals are bred, the consequence as to the width of the chest and the proportions depending on the same may easily be inferred.

THE CRITERIA FOR DISTINGUISHING THE TYPE OF RACES AND TRIBES AMONG SHEEP.

(A Report by Superintendent WANIEK, to the meeting of the Association of Sheep Breeders for the Kingdom of Bohemia.)

The commissioners appointed at Breslau to establish a terminology in sheep breeding have declared that the Negrettis and Escurials are not two distinct races, but two tribes of one and the same race.

The question is, wherein do these two tribes agree so as to form one race, and whereby are they distinguished to be divided into two tribes?

For a long time breeders distinguished Infantados, Negrettis, Electorals or Escurials, Guadeloupes, Paulers and other sheep, and called them all races, as Infantado race, Guadeloupe race, &c. In the year of 1823, the Convention of wool growers at Leipsic, at the instance of Mr. Thaer, now deceased, proposed to bring order into this chaos and to reduce all these varieties to *two* races; namely, the Infantado and Electoral races.

But this division into two races was not generally approved, at least not the names of the same; for the name Electoral in the then electorate of Saxony was merely a provincial name, and they could see no good reason why, if the races were to be baptised anew, it should be done only to one and not to the other. Especially the sheep breeders of Austria protested against it, and determined in their minds to call the sheep bred in the Austrian empire *Imperial* sheep, from the Latin word *imperium*, those bred in Saxony should be called *Electoral* sheep, from the Latin derivative *electorate*.

In order to avoid these rivalries impeding the progress of science, and not ungratefully to withhold the acknowledgment due the pure-blooded Spanish Merinos, the commissioners appointed at the meeting of German Agriculturists and Foresters at Breslau, in 1845, resolved to retain the original Spanish names and, therefore, declared:

"There is but one race of Merinos, in which two distinct tribes have been formed by breeding, at present called the Negrettis and Escurials; and of these there are various specimens, some of which approximate the one, and others the other tribe. Without regard to the properties of the Escurial and Negretti wools, which will vary according to the principles adopted in breeding, these two varieties are distinguished, by their statures.

"1. The Escurial sheep is slim, and has long legs, a long, narrow head and smooth neck; while,

"2. The Negretti sheep is short-legged and barrel-shaped, has a shorter and thicker neck, and is provided with a goitre and wrinkles on the neck, and with more or less wrinkles on the skin over its whole body."

Such was the declaration of the commissioners. It is singular that these commissioners have not described the distinction between the wools of these two tribes, but confined themselves entirely to the distinguishing characteristics of their statures. The reason is very obvious, because there is really no difference between the wools of the Escurials and Negrettis; for,

1. The belief was grossly erroneous, that the Negrettis, originally imported from Spain into Austria, had a coarse wool laden with a rosiny fat, or (as it has, since the regeneration of the Negrettis, been more leniently expressed) had a less fine and less soft wool, very unequal on the various parts of the body. The flocks of Moravia, being descendants from the original Imperial stock flocks, have proved that among the Negrettis brought from Spain, there were many individuals which excelled through their very fine wool, possessing the smallest, uniform undulations, and an easily soluble oily wool fat; therefore,

2. The wool designated here as very fine must not be considered the product of the Escurials exclusively, but also of the Negrettis, according to the tendency and intelligence in breeding adopted and evinced in Spain already; and on the other hand, the original Escurials brought from Spain, from which the flocks of Saxony descended, were not exclusively very fine, but there were many pretty coarse individuals among them.

3. Finally, in the Negretti flocks of the present day whose original blood can be proved, an intelligent breeding has produced whole folds whose wool answers all the demands made on the noblest product. Thus it would be untrue, if we should say that the Negrettis are distinguished from the Escurials by their inferior wool.

In representing these two tribes the erroneous distinction between their wools must be entirely discarded, for there exists none nowadays. Therefore the commissioners say that the properties of their wool will vary according to the various principles and methods pursued in breeding. Both tribes are sheep, and the body of the sheep, to whatever tribe it may belong, is only the ground on which the breeder produces his wool. The production is the result of his intelligence and the end aimed at. On both tribes a dense or thin, fine or coarse wool may grow; and fine thread may be produced on Negretti ground, as well as felt on Escurial ground.

But even if the wool is not considered a distinguishing criterion between the two tribes, their mere statures alone do not complete the distinction to designate them as two tribes of one race.

All I have said so far are introductory remarks for a better understanding of my view of this question, which reads as follows:

"*Wherein do the Negrettis and Escurials agree to form one race, and wherein do they differ to be divided into two tribes?*"

This question evidently presents two points, namely:

a. What constitutes a race?

b. What constitutes a tribe?

I take the liberty of answering these two questions in the following way:

a. An essential difference in the wool constitutes a race.

b. The difference in the pre-organized disposition to produce one and the same kind of wool constitutes a tribe.

I shall try to explain both answers.

First, the distinguishing criteria of the races, thus:

a. Man has brought the sheep from the wilderness into his house for the sake of the wool, or he keeps it chiefly for the same; therefore we can hardly establish any other distinguishing criterion but the wool itself.* Therefore:

Essential differences in the wool constitute the races.

We know the common sheep; we know the English Leicester sheep; we know the Spanish Merino sheep. Wool is produced by either of these sheep, but the one kind of wool is essentially different from the others.

Physiology presents us a wool hair on the common German country sheep, which, according to microscopic investigations, differs in its structure essentially from that of the Merino sheep; it is of an entirely different character. The common wool lacks softness; it possesses too little elasticity, too little wool fat, but little *(shrinking)* quality of contraction, yet considerable *fulling* quality. Likewise, the wool of the Leicester sheep differs in other respects from the wool of the common sheep as well as that of the Merino sheep. The wool of the Leicester sheep is pretty soft, but has no (shrinking) power of contraction at all, almost no fulling power, is quite straight, grows very long, and is quite dry. By these so essentially different products, therefore, we must distinguish these animals as different races—the common German race, the Leicester race, and the Merino race. But I say deliberately: Essentially different wools constitute the races. Yet this essential difference must be of such a nature that the properties of the wool of the one race can not be conferred upon the other but by a crossing between both races. There must exist *no* potency, *no* factor, in the one race through which the breeder may be enabled to produce in it, by in-and-in breeding, the properties of the wool of the other. In the English Leicester sheep the pre-organized fundamental conditions for the production of wool must be of such a nature that it will bear no Merino wool, even if it be bred for a century, and all its innate factors be made to bear upon this object; so that, if we wish its wool to attain any property of the Merino wool, we are obliged to pair Merino bucks with Leicester ewes, or to cross these races. Thus, it is clear that Merinos and Leicesters may justly be called two different races.

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* If now-a-days the size and fattening quality are taken into consideration, it is done to obtain simultaneously a larger area for the growth of wool; mutton will always be a point of secondary import.

The difference in the preorganization of the common country sheep is not so strikingly (but yet essentially) different from that of the Merino sheep. In the common sheep we find the length or height of the wool already somewhat homogeneous—also some powers of contraction; and if it be bred with a tendency to lessen the diameter of the wool hair, the wool may become somewhat finer. But two of the most important factors—*softness*, which cannot be obtained on account of the pre-organized construction of the walls of the hair tube,[*] and the *wool fat*, the exclusive attribute of the noble Merinos, will always be wanting, and at last tire the experimenter. I am, therefore, of the opinion that at present we do not commit a gross error by classifying the common sheep as a peculiar race, because we find now, or according to observations made thus far, no factor in the common sheep, through the preservation and cultivation of which we might obtain a Merino wool.

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[*] The original theory, *that the noble Merino wool is distinguished from the common by its undulation, was an error, a gross error*. If undulation be the criterion of nobility, the wool of the Hungarian Heath sheep (Zackel) must be noble also, for it is undulating. Or at what number of curvatures on the inch ceases the wool to be common, and begins to be noble? Are 3, 4 or 5 curvatures yet common, and 4, 5 or 6 noble? Undulation is but a visible sign of a noble wool—a sign, and not even the only one; but it is not the property *constituting* nobility. We learn many truths by external observations, but we do not ascertain the causes of these external phenomena, and, therefore, are easily led astray in the practical applications of the same. Thus, undulation being only an *external* sign, has been made the *objective cause of knowledge*, and many breeders have been led astray by it, who tried to obtain more and more curvatures or windings, until the well known "*thread*" (twist) was produced. The difference between the noble and common wool—thus, the objective cause of the nobility of the former—consists in the following: Every wool hair is a cylinder, every one (the common as well as the noble) being a tube throughout; but in the common wool this tube is very narrow, and its walls are proportionately very thick; while in the noble Merino wool this tube is very wide, and the walls are very thin. Therefore, the so-called *fineness* (which led to many errors) is not always a proof of nobility. A hair of a larger diameter may be nobler than one of a smaller diameter, according to the proportion of the hair tube to the hair walls. These fine-built and thin walls cause the pleasant, yielding touch—*softness*—which is wanting in the wool of the Zackel, in spite of its undulation, as well as in the thread-like wool in spite of its fineness, and constitute nobility. The hard and thick hair walls in the wool of the common sheep (as I have shown above,) are the cause why no improvement can be effected by in-breeding; for whence shall the thin hair walls originate, if thick ones are always paired with thick ones? WANIEK.

The case is somewhat different between the Hungarian Zackel (Heath sheep) and the English Leicester race. Both wools grow high or long, and have no power of contraction, no wool fat, and nearly an equal fulling power. At least we find no essential difference in their wools; but whatever difference there may exist between both may be attributed to climatic influences and the keeping and feeding. Therefore, I believe that the English Leicester sheep and the Hungarian Heath sheep belong to one and the same race, since the structure of the bodies does not present any essential difference. Thus, because the English Leicester sheep, the common German sheep, and the Spanish Merino sheep produce wools essentially different, therefore they are different races.

b. The preorganization to produce one and the same kind of wool constitutes tribes.

We have seen that the Leicester sheep and the common sheep produce each a different kind of wool, and, therefore, form each a distinct race. This is not found in the Negrettis and Escurials. In these we find one and the same kind of wool; the most noble original Negrettis, of which there were many among those imported into Austria directly from Spain, bore a wool equal to that of the finest Electorals of Saxony. At the present time yet we find fleeces of Escurials and Negrettis which cannot be distinguished at the sorting table. Thus, both produce one kind of wool, and, therefore, we cannot call them two races, but one race. But they are not one and the same kind of sheep.

Although they are destined to furnish the same product, yet they are differently preorganized for this purpose. The difference between Escurials and Negrettis consists in the following:

1. The forms of their bodies are different. The Negretti sheep is built like a barrel, has a broad neck and head, a developed and goitre, and on the neck, as well as over all the body, more or less wrinkles.

But the Escurial sheep is slim and long-legged, has a long, narrow head, a smooth neck, and no wrinkles at all.

2. On account of its barrel-like form, the body of the Negretti sheep presents a larger wool field than that of the Escurial sheep.

3. The skin of the Escurial sheep is thin and tightly fitting over the body; the skin of the Negretti sheep is thicker in its construction and resembles a coat full of folds.

4. On account of its thin, tightly-stretched skin, the Escurial sheep is apt to have a weak hair ground; when thronged in crowded folds the wool will spin easily, as it is called (be pulled out); and, especially during eweing time, the Escurial ewes lose much of their wool. This is not so with the Negrettis, whose thicker skin has a tenacious hair ground.

5. For this reason, the Escurial sheep, with their generally thin growth

of wool, often have a bald head, a bald belly, and bald feet; while the Negrettis are often overgrown with wool down to the nose and the hoofs.

6. When Escurials of the nearest consanguinity are paired together, a so-called *airy* animal, with a very weak hair ground, will be produced, not rarely in the first generation, but surely in the second.

The vigorous constitution of the Negrettis withstands this mistake in breeding often into the third generation.

7. The Escurial sheep produces sufficient wool fat of an easily soluble, oily nature, which is very favorable for softness and flexibility; but the Negretti sheep is so organized as to produce an abundance of wool fat. (By the way, we will remark here that this is one of its most valuable properties, because in it the hair has an excellent nutriment, and excels by its power and strength, and because it protects the wool *en masse* longer from becoming dry and fragile, than the wool of the Escurial sheep. In general, wool fat is a criterion of nobility, for the common sheep has none.)

But this wool fat of the Negrettis often is resinous, and in this condition it is detrimental to flexibility, and often cannot be removed by washing.

8. The Escurial sheep is better organized for producing an equal wool on the whole body than the Negretti sheep, and therefore equality of wool is more easily attained in an Escurial flock. Besides, the attainment of equality is impeded in the Negrettis by their wrinkles, on which, even when equality has been accomplished already in the extremities of the body, the glossy hairs will long remain.

Comparing all the distinguishing characteristics here mentioned, we find, in general, the weak sides of the Escurials to be a weak hair ground and a want of overgrowth, and those of the Negrettis a resinous wool fat, and the difficulty in attaining equality of wool. Hence it is evident that if we, in breeding Escurials, aim at two points, namely, the overgrowth of the body with wool, and a dense growth of wool, and in breeding Negrettis, at the improvement of the wool fat and equality of wool, and thus, by in-breeding, endeavor to produce the noblest wool in either tribe, the product of the (most thoroughbred) Escurial sheep must be perfectly equal to that of the (most thoroughbred) Negretti sheep in the end, both tribes will stand as one race beside each other.

Hence, it follows that, although the preorganization necessary for producing the noblest wool cannot be denied either of these two tribes, yet this great object will be accomplished much easier and quicker if the necessary favorable factors more prevalent in the one tribe are communicated to the other, i. e., if both tribes are paired together—crossed—if it be necessary.

The long-continued controversy as to whether Escurials and Negrettis may be paired together—a controversy arising from the supposition that these were two heterogeneous races which has been proved to be erroneous by practice—may thus also theoretically be considered settled.

The two principles advanced:

1. Essentially different wools constitute races.
2. The difference in the preorganization for producing one and the same wool, furnish the answers to our questions, namely:

1. Wherein do Negrettis and Escurials agree to form *one* race?

Answer—They produce one and the same wool.

2. Whereby are they distinguished to be divided into *two* tribes?

Answer—They are differently preorganized for producing one and the same wool.

ON A REMARKABLE DIFFERENCE BETWEEN THE RACES OF SHEEP, IN THE DURATION OF THEIR PREGNANCY.

The zoological gardens afford a new and better opportunity for the observation of animals; we have the living specimens before our eyes. The view extends farther than to the troublesome and often useless comparison of skins and hides, and the observer obtains a more thorough knowledge of the subject. Since it is now possible to make, within a few days, comparitive observations in ten zoological gardens, different opinions on constancy and forms, their significance and importance are formed. We are enabled to draw living phenomena into the cycle of our observations which hitherto remained unnoticed, because the material was wanting.

Since zoological gardens have been established I have hoped that the breeders of domestic animals might combine their efforts for the advancement of the cause, chiefly by communicating such observations as are of a more general importance, for the purpose of expanding the knowledge of animal life.

As a breeder, I have had the opportunity of observing various domestic animals, and among these especially two races of sheep the exterior appearance of which is so different that many zoologists, in seeing stuffed specimens in museums, would doubtless pronounce them different tribes. We have hundreds of so-called tribes showing much smaller differences than those two races of sheep—the *Merinos* and the *Southdowns.*

First, I will mention a circumstance which surprised me in various respects. It is the constant difference in the period of pregnancy in the two races. It is known that the duration of pregnancy in our domestic animals varies somewhat according to various circumstances. A mare, for instance, in which by nutritious food and appropriate work, a rapid change of matter takes place, has in general a shorter period of pregnancy than one which does not work, and consequently is not so well fed. But as far as I know, it has hitherto not been observed that the duration of pregnancy is conditioned by the quality of the race, under circumstances presenting the same conditions in every respect.

The *Merino* sheep, of which the following observations have been made, descend from those animals which were imported into Germany from Spain in the latter half of the eighteenth century. For the last twenty-two years the flock has been bred and kept at the same place, and has attained already to the seventh generation.

The *Southdowns* descend from the noblest flocks of England, and for the last twelve years have been bred and kept at the same place, and under the same conditions with the Merinos; they have been bred here already to the fifth generation.

The animals of both races have in summer lived on the same pastures, and in winter been kept in the same fold, received the same food, and both races lived mixed in the same flock. The lambing time was with both regularly from January to March; *yet the Merinos bear the fruit, on an average, six days longer than the Southdowns.* It must yet be mentioned that the Southdown flock received several additions by the importation of new original animals from England, but between the animals first imported, of which several have brought forth lambs for ten or eleven consecutive years, and those born here in the fifth generation no difference has been observed in that respect: the shorter period of pregnancy is constant in the individuals imported and in their offspring now bred in the fifth generation.

I have said above that no conditions explaining this phenomenon could be found in the keeping of the animals, the food, exercise, locality, state of health, &c., but the opinion that the difference is found in the peculiar character of the races, is confirmed by the observation of the period of pregnancy in such animals as have been produced by crossings between the two races. Southdown rams were paired with Merino ewes, whereby so-called half-blood animals were produced; the half-blood ewes were again paired with Southdown rams of pure blood, whereby three-quarter blood was produced; the three-quarter blood ewes were again paired with Southdown rams of pure blood, whereby seven-eighth blood was produced. All the animals produced by the above crossings in three generations were born, bred, and kept under exactly the same conditions as the original animals. But the average period of pregnancy amounted—

In 165 half-blood ewes to 146, 3 days.
In 105 three-fourth blood ewes to 145, 5 days.
In 45 seven-eighth blood ewes to 144, 2 days.

The proportion of these figures to each other, as well as to the average figures of the pure breeds, is so striking that I am fully convinced that the duration of pregnancy is really a peculiarity of the race.

If we may go beyond the fact for an explanation, we must first mention that *early maturity* is one of the most prominent properties peculiar to the Southdown race. When a little over one year old, these animals are already so far developed that they are fit for butchering and capable of propagation and by this quality, beside others of less importance, their great value for the more advanced state of agriculture is conditioned. Early maturity is an acquired quality, not a natural, morphologically innate property; but how constant it is in the race is shown by the above stated phenomenon. Yet it is possible that the shorter period of pregnancy is in connection with the early maturity having become a quality of the race; for physiologists must now admit that birth is caused, not by the producer alone, but also by the production; that it is not only an ejection on the part of the mother, but also vital action of the mature fetus. We may, therefore, say that the quality of early maturity is so far developed already in the fetus, that the same terminates its life in the uterus earlier than is the case with those races which come later to maturity also after their birth.

In regard to the method of these observations, I have yet something to add. All the ewes have regularly been covered by the rams every year in the months of September and October, in the mornings, between seven and nine o'clock: the births have regularly been recorded in the mornings, between ten and twelve o'clock. Thus, there is a slight incorrectness in the above figures, since the births taking place in the afternoon have been recorded and dated on the following morning; hence all the figures are too little by a small fraction of a day. But this slight incorrectness in the average figures does not affect the result in question, because it is the same with all the figures. Finally, we will yet mention that all the sheep used for these observations were marked on the inside of the ears with black numbers, so that every individual was known as such; for breeds in which every individual has a recorded history, from its conception throughout its whole life, are particularly adapted to such observations as those here communicated.

THE PRODUCTION OF WOOL ON THE EARTH.

BY M. ELSNER, OF GRONOW.

A book of the above title was published last year, and as the same does not even give an approximating estimate of the wool produced on the earth, the writer of this essay determined, in his rural seclusion, to collate his information on this subject, in order to obtain himself a more correct estimation. Living at great distance from literary sources, the material at his command was, of course, very limited, and by request of the editors of these Annals,* he consented to the publication of his observations only in the hope that some abler writer, provided with ampler means of information, might be induced to give the public something better and more reliable than they have so far received on this interesting field.

Since the most ancient times, wool, and particularly sheep wool, has formed the most important clothing material for civilized nations, because it may easily be turned into clothing stuffs, even by the mere process of felting, and because it is a poor conductor of heat, is soft and flexible, may easily be colored, and is durable.

So far as our historical sources go we find that great attention has been given to sheep breeding, Of this the Bible and the classic authors give evidence, and especially Columella, who, in his seventh book, has given rules for the breeding and keeping of sheep, which still hold good and are applicable this day.

This rearing of the wool-bearing animals has continued to this day in the old seats and original homes of human civilization, even if they may have retrograded in other respects; for the high-lands of Asia, with their fine goat wools and hairs; the Caucasus and the Crimea, with their splendid sheep fleeces; Asia Minor, with her excellent textures and carpets; Naples, with her beautiful comb wools; and Spain with her Merino wool, now ruling the world, still occupy a prominent position in the commercial world, as in ancient times did *Phasis*, *Miletum*, *Tarentum* and *Hispania*.

But with the progress of human civilization, the production of wool, which in the old world was confined to the northern, and in the new to the southern hemisphere, has spread in two great circles around the earth, occupying, to a greater or less extent, all localities and regions where the climate was favorable, in order to draw from the yet uncultivated parts of the globe the supply of clothing material for those countries, where partly the increase of population limits the production of wool, partly their increasing wealth creates a greater demand for clothing material.

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* No II. of the Annals of German Cattle Breeding, for 1864.

These two circles around the globe wherein wool-bearing animals will thrive, extend, towards the equator, in general, to the tropics, reaching into the equatorial or torrid zone only in those districts where local elevations produce a cooler temperature of the air. In the tropic and subtropic regions, the animals need no protection from the changes in the temperature, and, therefore, the sheep found there have only a cover of the skin resembling doe-hair, offering their flesh to man for food, *ovis guineensis*, the demman, the zunu and coquo.

From the tropics, wherever the locality is favorable, the wool-bearers spread far north and south, in the northern hemisphere beyond the 60th degree of north latitude, placing a weak, extreme outpost on the island of Iceland, surrounded by the Gulf stream, and possessing other climatic advantages; but, in general, the wool-producing territory is bounded by the line of the annual isotherme of O°; while the southern hemisphere, as far as it is inhabitable, even Terra del Fuego not excepted, is suitable for them, climatically.

Thus, the wool-producing countries are:

I. IN THE NORTHERN HEMISPHERE.

A. *All of Europe*, excepting the northernmost portions ot Norway, Sweden and Russia.

B. In *Asia:* South Siberia, the highlands of Central Asia, China and Japan, the mountainous regions of Hindoostan, Persia, the Caucasus Mountains, the Asiatic possessions of Turkey, with the exception of southern Arabia.

C. In *Africa:* Northern Egypt, Tripoli, Tunis, Algiers, and the largest portion of Morocco.

D. In *America:* The southern portions of the British possessions in North America, the largest portion of the United States of North America, and Northern Mexico.

II. IN THE SOUTHERN HEMISPHERE.

A. In *Africa:* The southern extremity almost to Ngami Lake, the elevated portion of Natal.

B. In *Polynesia:* Nearly all of New Holland, Van Diemen's Land (Tasmania) and New Zealand.

C. In *South America:* The La Plata States (Uruguay, Buenos Ayres, Paraguay, Entre-Rios), Chili, parts of Peru, Bolivia and Brazils, Patagonia and the Falkland Isles.

These regions comprise the following vegetable kingdoms, and have the following average temperatures, according to the centenary thermometer:

1. The kingdom of the umbellatæ and cruciferæ in Northern Europe and Northern Asia, with a yearly temperature of 2½—13.75°.

2. The kingdom of the labiates and caryohylleæ on the coasts of the Mediterranean Sea; yearly temperature, 12½—22½°.

3. The kingdom of the aster families and solidaginæ in North America; yearly temperature, 12½—15°.

4. The northern portion of the Magnoliæ, and the central portion of the United States of North America; yearly temperature, 15—22½°.

5. The kingdom of the camelliæ and celastrinæ in China and Japan; yearly temperature, 12½—20°.

6. The emodian kingdom, the southern slopes of the Himalaya Mountains; yearly temperature, 2½—18¾°.

7. The botanically unknown central Asiatic kingdom.

8. Portions of Bonpland's kingdom in Mexico; yearly temperature, 18—20°.

9. Portions of the kingdom of the cinchonæ (Humboldt's kingdom in the Cordilleras); yearly temperature, 15—20°.

10. The kingdom of the escalloniæ and calceolares in the Cordilleras, adjoining the former, but more elevated; yearly temperature, 1—15°.

11. The kingdom of the ligneous synantheræ in Chili, and in the eastern portions of the Cordilleras; yearly temperature, 15—20°.

12. The antarctic kingdom; yearly temperature, 5—8°.

13. The kingdom of the mesembrianthema and stapelia in Southern Africa; yearly temperature, 12½—22½°.

14. The kingdom of the eucalyptæ and eucapridæ (Australia and Tasmania); yearly temperature, 11—22°.

15. The New Zealand kingdom; yearly temperature, 12—17°.

Thus, of the 25 vegetable kingdoms generally presumed to exist, 15 are, chemically, adapted to the production of wool, and whenever the dry climate, as in South Africa and South America, should prove unfavorable, they furnish in their juicy plants (mesembrianthema and portulaceæ) the means for rendering the want of water less pernicious.*

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* Among the many hundreds of vegetable families forming the vegetable kingdom, there are only a few which have a powerful influence upon the life of the wool-bearer, and only the following plants are of importance to herbiverous animals:

1. Of the lichens and mosses, only *cetraria islandica*, Iceland moss, which is found on all the higher mountains of Europe.

2. The asses, *gramineæ*.

3. The o achs, *chenopodieæ*, beets.

If the area of those countries in which the climate permits the keeping of wool-bearers is approximately estimated in square miles, we find that there are:

I. On the Northern Hemisphere.

	Geog. Square Miles.
1. In Europe, about	136,000
2. In Asia, about	234,000
3. In North Africa, about	30,000
4. In North America, about	150,000
Total	550,000

II. On the Southern Hemisphere.

	Geog. Square Miles.
1. In South Africa, about	6,000
2. In South America	50,000
3. In Polynesia	76,000
Total	132,000

or, on the whole globe, about 682,000 geographical square miles.

This is, in round numbers, the area in which the climate permits the keeping of wool-bearers, namely, sheep; or if the surface of the earth is set down at 9,260,500 geographical square miles, that area comprises about 1-14 of it.

If we estimate the temperate zones at 4,807,976 square miles, the above figures amount to about 1-7 of the same.

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4. Plantains, *plantagineæ*.
5. The *scrophularineæ*, among them the *veronica*.
6. The *asperifolia*, among them *symphytum*, &c., dog's tongue.
7. The *labiates*, sage, thyme.
8. The *ericeae*, heather.
9. The *diptaceæ*, scabii.
10. *Senecionideæ*, cross weed.
11. The *asterioideæ*, especially in North America, daisies.
12. The *cichoreæ*, among them the dandelion.
13. The *cynarocephali*, among them the thistles.
14. The *campanulaceæ*, the bellflower.
15. The *papilionaceæ*, clover, lucern, vetches, &c.
16. The *portulaceæ*, in South America.
17. The *saxifragas*.
18. The *cactus*.
19. The *ficoideæ*, among them the mesembrianthemum, for Southern Africa.
20. The *crossulaceæ*, also in Southern Africa.
21. The *alsineæ*, among them spurry.
22. The *sileneæ*.
23. The *polygaleæ*.
24. The *coniferæ*, or cross blossoms, among them rape, kale and turnips.

The land of the earth amounting to about 2,380,000 geographical square miles, the area adapted to sheep breeding comprises more than ½ of the land.

On this area, more than three-fourths of which lies in the northern hemisphere, all the wool on earth is produced, and most of it consumed.

In those countries which are, climatically, adapted to the production of wool, there live, in round numbers, the following inhabitants:

1.	Portuguese	4,035,000
2.	Spaniards	15,455,000
3.	Frenchmen	34,240,000
4.	Italians, without Venetians	22,579,000
5.	Swiss	2,511,000
6.	Belgians	4,782,000
7.	Dutch, without Luxemburg	3,416,000
8.	English, including the posts in the Mediterranean	29,307,000
9.	Danes and Icelanders	1,670,000
10.	Swedes and Norwegians	5,400,000
11.	Prussians	18,500,000
12.	Austrians	36,019,000
13.	Other States of the German Confederacy and Sleswig	18,482,000
14.	Turkey, and the countries under its protectorate	15,730,000
15.	Greece and Ionic Islands	1,344,000
16.	European Russia, with Poland and Finland	65,000,000
17.	Asiatic Russia and the Caucassus regions	8,000,000
18.	Turkish possessions in Asia	16,000,000
19.	Persia	10,000,000
20.	Cashmere, Herat, Kelat, Mekran, Buchara, Hissar, Shehrsabel, Kundus, Chokand, Derwazeh, Caffristan, Caratzin, Buruts or Caragirghese, Chiwa, and Turcomans	10,000,000
21.	Indian mountainous regions and the southern slopes of the Himalaya mountains	10,000,000
22.	China and Mongolia	400,000,000
23.	Japan	25,000,000
24.	Northern Egypt	2,000,000
25.	Tripoli	1,500,000
26.	Tunis	800,000
27.	Algiers	3,000,000
28.	Morocco	8,500,000
29.	British North America	3,400,000
30.	United States of North America	31,450,000
31.	Northern Mexico	3,000,000
32.	Peru	2,000,000
33.	Bolivia	1,500,000
34.	Chili	1,500,000
35.	Argentine Republic	1,170,000
36.	Paraguay	1,330,000
37.	Uruguay	241,000
38.	Southernmost portion of Brazils	300,000

39. Falkland Isles	600
40. Cape Colony and Natal	1,350,000
Total	840,901,000
Of these, there are on the southern hemisphere	9,781,000
Thus, there are on the northern hemisphere	831,120,000

According to old statistics it was estimated that in those countries where sheep are kept, about one sheep fell to each inhabitant, and that each inhabitant consumed about 2 lbs. of wool, or the yearly product of a sheep. This would amount to a consumption of about 1,681,802,000 lbs. of wool. Hereinafter we shall see whether this estimate is correct or not.

As that portion of the surface of the earth where the climate is suitable for the production of wool has an area of 682,000 square miles, there come upon the square mile of this area 1,233 inhabitants, namely, 1,511 in the northern, and 74 in the southern hemisphere.

Here we will remark that we have made too small a deduction for the districts not suitable for the keeping of sheep in China, but, on the other hand, did not bring into account the large consumption of woolen stuffs in the equatorial regions.

After we have thus obtained an approximating idea of the area of those countries which are adapted to the production of wool, and their relative population, we will direct our attention to the species of animals furnishing wool or textile hair.

If we do not take into consideration the large quantities of horse hair used for textures, bolsters and wigs, and those of human hair for various head-dresses, and the consumption of hare wools and the hairs of *lepus timidus*, the hare, and *lepus cuniculus*, the rabbit,* all the other animals bearing wool or hair suitable for textures belong to the species of the

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* South America and Russia furnish the largest quantities of horse hair, Ireland the best quality, and Holland the next best. The curled or boiled horse hair is used for bolsters; this comes from Russia in bales of one berkowez or 10 puds; the long horse hair is used for manufacturing hair cloth and bolting cloth, which must be at least 24 inches long, and comes from Russia in bales of 2 berkowez or 20 puds. A pud is 32¾ lbs.; a berkowez is 10 puds, or 327½ lbs. Human hair forms an important article of commerce: France furnishes the dark, Germany and the provinces on the Baltic Sea the light shades; very long hair comes from China. One head furnishes ¾—1¼ lbs. of hair. In France the hair crop amounts annually to about 200,000 lbs. The common length is 25—35 inches. The best long hair is worth from 10 to 40 thalers, the short from 1½ to 6 thalers per pound; long and naturally curled light hair is the most valuable.

The wigs of the English judges are made of horse hair, those of the coachmen of goat's hair.

The manufacture of two millions of fine hats would require 8—10 millions of hare skins, since 3½—5 skins give one hat; on an average, 10 skins give 1 lb. of hair.

bisulca or *ruminantia*, and in these species again to the families of *bovina* or *cavicornia* and *tylopoda*.

In the former family, and in general, *capra ovis*, *ovis* or *ovis aries*, the sheep, with its many varieties, stands pre-eminent: then there are the goat, *capra hircus*, with its many varieties, *angorensis*, *thibetanus* and *laniger*, all natives of Asia; *bos grunniens* or *poephagus grunniens*, the grunting ox, yak, of the Himalaya Mountains, and the common cow hair are extensively used in the manufacture of blankets and carpetings. To the second family, that of the *tylopoda*, belong, in the old world, the camels and dromedaries—*camelus bactrianus*, the camels with two hunches, *camelus dromedarius*, the camel with one hunch or dromedary; in the new world, the llamas or auchenia, with their tribes and varieties, llama, paco (al-pacca—al being the Moorish-Spanish article, and pacca or paco the Indian name of the animal) vicuna, moromoro, guanaco and amida.

The varieties of *capra hircus*, goat, being of importance as wool bearers, inhabit a similar small territory in the mountains of Asia, as the *auchenia* or llamas in the Cordilleras of South America; and we shall yet see whether the attempts at acclimating them in Australia will fail like those at introducing the Thibet and Angora goats in Europe.

Camelus, the camel, in both varieties, is found all over the steppes and deserts of the northern hemisphere.

Capra ovis, the sheep, the chief wool bearer, in its various forms, inhabits all the wool-producing regions. It is comparatively indifferent to us from what wild animal the domesticated sheep may be a descendant, but since in those regions where wild sheep will thrive, the domesticated may probably be kept also, we will make the following remarks:

Ovis musimon, the mufflon, *muffolo* in Corsica, *mussione* in Sardinia, which Pliny, Book VIII., chapter 49, calls *musmon* in Corsica and *ophion* in Sardinia and Spain, and whose crosses with the domesticated sheep he designates as *umbri*, which also Varro, Book III., chapter 12, and Appianus, Book II., p. 326, mention, is found in Sardinia, Corsica, Cyprus and Crete, European Turkey, and, according to Gmelin and Pallas, also in Persia, and on the coasts of the Black and Caspian seas. To this family also the bharal of the high mountains of Thibet probably belongs, which Hoffmeister found grazing in flocks of 60—80 head near the snow-line. The bucks which M. Columella crossed with his Tarentine ewes, and which his cousin Lucius Inn. Columella, the celebrated agricultural author, calls *silvestres ac feros arietes* (wild forest sheep), probably belonged to this species.

Ovis ammon inhabits Argali, Siberia, Kamtschatka, the Curiles and Aleutes.

Ovis montana, the mountain sheep, the *culblanc* of the North American trappers, is found in North America from the Mackenzie River to northern Mexico.

The domesticated sheep comprises many varieties which, as wool bearers, are only of importance to us in respect to the color and quality of their hair.

As to color, we find black, gray, brown, reddish and white, and checkered sheep of all these colors; the reddish (doe colored) are, as already Columella says,* natives of Asia, and remind us of the doe-colored demman.

Any color has a noxious effect in coloring, and therefore the ancients already preferred white sheep, as many passages of the Bible, Columella, and Virgil prove. Colored sheep are valuable only for certain purposes, namely, when the pelt is used as fur, and for certain stuffs, since some monastic orders are not allowed to wear colored stuffs, while dark stuffs are prescribed for cowls; and certain fancy wares are more valuable for being made of uncolored wool.

The noblest and finest wools are produced in the centre of every zone. They require an annual temperature of 15° Celsius, or 12° Reaumur, exactly the same as is most favorable for the culture of silkworms and grapes. But since sheep are movable, and stables may afford a higher average temperature than that peculiar to a locality; and since they may escape unfavorable atmospheric influences by migration, as in Spain and Italy, and by going up or down mountains, or by being kept in stables, the northern and southern boundary line for the production of fine wool is not so precisely drawn as that for the culture of the vine and white mulberry tree, *(morus alba)*, the breeding of silkworms being chiefly dependent on the latter. Yet for the natural production of the finest and noblest wools, we may establish 8–10.8° Cels. (6.4–8° R.) as the extreme annual temperature, 8–10.8° Cels. as the boundary line of elevation, and, as said above, 12° R. as the most favorable annual temperature.

The central line of this zone would thus run through northern Spain, southern France, Corsica, central Italy, central Turkey, northern Asia Minor, Thibet, central China, the peninsula of Corea, southern Japan, northern California, and thence in a pretty straight line throuth the United States into northern Virginia, in the northern hemisphere. In the southern hemisphere it runs, beginning at the mouth of La Plata river, and ascending several degrees westward, through northern Chili, the northern portions of New Zealand, and the southernmost portion of Australia, merely touching the Cape of Good Hope.

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* Col. VII. The white color is the best and most useful, because other colors may be made of it, but this color of no other. The reddish and dark-brown sheep which Pollentia in Italy and Corduba in Baetica produce, are no less valuable. Asia also produces red sheep. (Translated from the Latin.)

See also 2d book of Moses, chap. 26, v. 14. Over this covering thou shalt make a covering of reddish badger's skins. Ib. chap. 36, v. 19.

Our (Silesia) annual temperature is about 6.5° R., or 8.1° Cels.; thus we are near the northern boundary line of the zone adapted to the production of the noblest wool, and afford the animals the necessary annual temperature by keeping them in warm stables during the winter season. Hence we may explain the singular phenomenon—why the northern coasts of France and Germany, why England, having a milder climate than we, never occupied a prominent place among the countries producing the noblest wools—why Australia, being so well adapted to the culture of the vine, the La Plata States and the Cape of Good Hope, in a comparatively short time succeeded in producing a good Merino wool—why, in general, those regions of the Old World celebrated for the culture of grapes, such as southern Italy, Spain, the Caucasus mountains, &c., took the lead in the production of fine wools, the other countries following them according to their local conditions and the skill and science of the breeders.

In order not to be misunderstood, we do not assert that the wine-growing zone can produce only Merino wool of first quality, but no excellent comb wool. We designated only the area where the production of fine noble wools is natural, while various circumstances may induce the husbandman to pay attention to the production of the finest wools seen outside of this zone. Hence the plains of northern Germany, Mecklenburg, the marshes, Saxony, Pomerania, &c., are fully justified in discontinuing the production of the noblest wools, in order to produce a wool better adapted to their conditions, whether the same be a less fine Merino wool, or some other kind. Hence it may also be explained why the controversy, as to whether the Escurial or the Negretti sheep should be preferred, became so animated in Silesia: because this country, so long renowned for its sheep breeding, lies at the northern limit of the zone of noble wools, and therefore it was most difficult for it to decide in favor of the one or the other. The zone of the noblest wools is bounded on both sides by the less noble, gradually losing in fineness toward the equator and the poles. These are partly coarse cloth wools, like those of the English Down sheep, partly fine comb wools, often valuable for their peculiar lustre, partly coarser Merino wools, which are sometimes more suitable for cloth wools, and sometimes for comb wools. Yet in these zones of the less noble wools, comb wools of a long staple are predominant;—under favorable annual temperatures they will also attain to greater fineness and softness, and a brighter lustre, as the Manxchamps wools, the splendid Neopolitan comb wools, the wools of the Angora and Cashmere goats, and certain kinds of Alpaca wools show.

Beside wool, the wool-bearers produce meat, fat, milk, and skins, and perform work. For our observation these are items of secondary importance, but of powerful influence upon the production of wool, and for this reason we will not pass them by unnoticed. The sheep provides man with the larger portion of his animal food. Therefore the production of meat interferes essentially with the production of wool, and exerts a powerful influence in two directions: First, in densely peopled regions the price of mutton, which is not so easily transported as wool, may rise to such a height as to make its production paramount; and secondly, partly through the consumption or non-consumption of mutton in sparsely peopled regions, partly in countries of peculiar religious views, sheep breeding will increase or decrease.

As a small domestic animal, the sheep, like the goat, is very valuable to the nomad using much animal food, and to the Mussulman, being allowed to eat no meat but that of ruminating animals; and this the more so, because the sheep is much easier fattened than the goat.

It makes a great difference whether a sheep, or an ox, or a camel must be slaughtered to provide a household with fresh meat; therefore, the sheep of the equatorial zone bearing no wool is found in such large numbers among the African nomads, that, for instance, according to Burton's estimate, 150 Somali warriors, or about 750 men, have 10,000 to 12,000 sheep.

Besides, the sheep furnishes the Mahommedan in its fat a substitute for lard which he is forbidden to use, and in the hotter regions, for butter; hence, the importance of the fat-tailed sheep, *avis laticauda* and *steatopyga*, for the steppes of Asia and Southern Russia, and for the Cape of Good Hope, being unsuitable to hog breeding. From the former regions considerable quantities of fine wether tallow is exported for food to Turkey and Persia.*

This production of fat is the reason why the fat-tailed sheep is kept in large numbers at the Cape of Good Hope, beside the Merino sheep, although it gives only about one pound of coarse wool per head. But in its tail it furnishes 30 to 40 pounds of fat, while its skin is of such excellent quality, that large quantities of them are exported to England in order to be there manufactured into gloves for horsemen and coachmen, called "dog's-skin gloves," or are shipped to Germany in order to be dressed there for buck's-skin pantaloons for farmers.

Of the various religions, Brahmaism forbidding meat as food, also prohibits the production of wool.

In other regions the value of the skin as fur is so great as to throw the production of wool into the background, so that even the mother is slaughtered to get a fur of extraordinary beauty from the unborn lamb. We mention the black Sicilian pelts—the extensive trade in sheep pelts, of which Debreczin alone furnishes 25,000; the Roman, "Zwatschels of the Austrians; the black pelt-caps of the Persians; the checkered carpet coverings made of long-wooled, colored English sheep skins—the great demand for carpets of sheep's skin used at prayer meetings in Central Africa.

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* Russia produces about three million hundredweights (112 lbs.) or eight million puds of tallow, of which about four million puds are exported. This tallow consists of two-thirds sheep's tallow, since even the yellow candle-tallow of first quality often contains a small admixture of sheep's tallow; the white candle tallow is all of Russian sheep, but the soap-tallow of Calmuck and Tartarian sheep. In Russia the production of tallow amounts to thirty million thalers. There are about 600 establishments engaged in the rendering of tallow.

Further, large quantities of sheep skins are consumed as leather; partly for parchment, partly to supplant goat's leather, partly for saffian, Morocco leather and Spanish leather, partly gloves and shoes, partly for bookbinding purposes, and for trimming leather.

The English sheep skins are split; the upper part is tanned with sumach, the lower is used for parchment and glove leather. The same is done with English lamb-skins, of which the upper part is used for shutting bottles and jugs, and the lower for trimming gloves. England furnishes about 15,000,000 sheep-skins, which are shorn, and imports 1,600,000 raw, 1,280,000 dressed, and besides, 1,400,000 undressed and 20,000 dressed lamb-skins. The undressed lamb-skins are mostly manufactured into gloves at Yeoville, in Somersetshire. Here we will also remark that Annonay, in France, dresses annually about four million goat-skins for glove leather, and that in France there are made about fifteen million pairs of leather gloves, and in England seven to eight million pairs of kid gloves.

Sometimes, as in Sardinia, and formerly among the German farmers, the value of the milk exceeds that of the wool; thus, the towns of Sassari, Iglosias, Sinai, Goceano, and Monte Acuto, in Sardinia, manufacture annually 40,000 hundredweights of sheep cheese for exportation.

Finally, in many cases, the chief consideration is the work performed by the animals, such as the camel, the llama, the burden sheep of Thibet, of which Hoffmeister has seen long trains, laden with Cashmere wool (lena) and shawl wool (uhn); the stout Yak ox, of the same regions, with his woolly back and silky hair hanging down to the ground. These animals are the means of transportation in the otherwise impassable regions inhabited by them, and besides produce considerable quantities of wool, since a camel furnishes on an average ten pounds, and a llama from five to seven pounds of wool hair.

Thus we have briefly described the countries and regions where wool is produced, and mentioned the influences bearing more or less on the production of wool; and being now pretty well informed, we may try to ascertain how much wool may be annually produced on earth.

We have seen above that, as to the area adapted to sheep-breeding and as to the wool-consuming population, the northern hemisphere has a great preponderancy; but this is still greater in respect to the manufacture of woolen stuffs, which, excepting some small beginnings in Australia and South America, is wholly confined to the northern hemisphere. But there it is so divided that it often escapes the collectors of statistics; for there is hardly any other branch of industry which has so strictly preserved its domestic character as that of woolen manufacture; even in regions where all other branches of industry are concentrated in large factories, as, for instance, in England, the largest portion of woolen goods is made by private weavers at their homes, and the so-called manufactories, *e. g.*, in Leeds, are, with a few exceptions, only finishing shops, which dye and dress the stuffs furnished by the private weavers.

In great manufacturing countries the manufacture of yarn of the coarse offal wool, and the stuffs made thereof has mostly gone to the factories; but by the side of these there are yet hand-looms enough, which furnish woolen stuffs, to vindicate for woolen manufacture the character of a domestic branch of industry, in comparison to cotton manufacture.

This, of course, is more generally the case in less civilized regions. Thus, the small province of Nova Scotia, adjoining Canada, furnishes annually no less than 1,321,000 yards, or about 2,000,000 ells of coarse woolen stuffs, made on hand looms, and being worth 900,000 thalers, and giving about 6 ells of woolen stuffs to every inhabitant. Likewise, the Swedish province of West Gothland brings annually about 500,000 ells of woolen stuffs into the market, made by private weavers at their homes, beside their own supply. The small Faroer islands furnish annually 120,000 pairs of woolen stockings. In Italy, about 15,000,000 ells of cloths are domestic manufactures; and in Morocco, Tunis, Albania, Macedonia, Asia Minor and the Asiatic Mountains, there are innumerable wool-spinners and wool-weavers, whose manufactures and the quantities of wool consumed by them can be estimated only approximately.

Therefore, the consumption of wool in the northern hemisphere is hard to determine, and may be estimated only approximately. If it were known, it would be the surest calculus for the production. Estimations based upon the most different and often very heterogeneous foundations must take the place of reliable figures, as will be shown afterwards when we shall have determined the production of wool in the southern hemisphere, where the state of things is quite otherwise.

These southern countries possess no woolen factories, or at most small beginnings of the same; therefore, they are compelled to export their wools and procure their supply of woolen goods from the northern hemisphere.

Moreover, those countries of the southern hemisphere, which produce most wool, are British colonies, and the largest portion of their product goes to the mother country, and a small portion only by New York to the United States, and by Havre de Grace and Antwerp to France, Belgium and Germany.

Thus their production may be determined as accurately as is necessary for our purposes.

The production of wool is known to increase in these countries—in Australia, at the Cape of Good Hope and South America. Therefore, where it is not indispensable, we do not extend our review to former years, but base our calculation upon the years of 1860 and 1861, for which we have collected the most dates.

Australia, with Tasmania and New Zealand, shipped to England:

In 1860	59,166,616 lbs. of wool.
In 1861	68,506,222 "

South Africa:

In 1860	16,574,345 "
In 1861	18,676,286 "

Thus the increase in the production of wool in Australia amounts to 8,339,606 lbs., or 14 per cent.; in South Africa, to 2,101,947 lbs., or 12.8 per cent.

But the increase from 1859 to 1860 amounted to 10.8 per cent. in Australia, and to 16 per cent. in South Africa; or the average increase for the two years to 12.4 per cent. in Australia, and to 12.8 per cent. in South Africa.

If the Cape of Good Hope still shows a small increase, it is by far not as large as was that for the fifteen years previous.

The Cape exported to England:

In 1861	18,676,286 lbs.
In 1847	3,477,392 "

Or in 1861, 15,198,894 lbs., or 437 per cent. more than in 1847, being a yearly increase of 29 per cent.

Australia shipped to England:

In 1861	68,506,222 lbs.
In 1847	26,056,815 "

Or in 1861, 42,449,815 lbs., or 160 per cent. more than in 1847, being 10⅔ per cent. per year.

This rapid increase of the production of wool in South Africa is in perfect harmony with the experiences made in Australia, whence the exports to England, in the fifteen years from 1834 to 1848, increased from 4,883,700 lbs. to 30,034,567 lbs., or by 25,150,867 lbs. or 515 per cent., equal to 34 per cent. per year.

The localities best adapted to sheep pastures are always occupied first; hence the increase of the flocks is more rapid in the beginning. But later, another circumstance makes the increase in the production of wool slower, namely, that the increasing population will seize those better sheep pastures for other more profitable crops, and thus drive sheep breeding before it into the uninhabited interior. But since Australia and the Cape possess no navigable streams to facilitate the commercial intercourse of the interior with the sea coast, the keeping of sheep becomes the less profitable the farther it is driven into the interior; because the transportation of wool to the sea coast, and of the necessaries of the owners of flocks and of the shepherds from the sea, becomes always more expensive, and takes away a large proportion of the profits.

Besides, those two wool-producing countries of the South suffer greatly from periodically dry years having a very unfavorable influence upon sheep breeding. This was the cause why, for instance, the exports from Australia to England, which in 1856 had amounted to 52,052,139 lbs., were reduced in 1857 to 49,209,655 lbs., and advanced no sooner than in 1859 again to 53,700,542 lbs.; while in South Africa the exports increased, in 1858, to 16,597,804 lbs., but were reduced, in 1859, to 14,269,343 lbs.

When we consider the increase of the production in the two colonies, extending in the last few years also to Natal, which possessed no sheep yet in 1857, and exported in 1861 already 651,000 lbs. of wool, and shipped any quantities of mutton at 5 silver groschen per pound to Pieter Maritzburg, where none was to be had in 1857; and when we consider also the direct shipments of wool from the Cape as well as from Australia to North America, the production of these two British colonies may be estimated in round numbers at 130,000,000 English or 117,000,000 Prussian pounds,* and since in New South Wales and Victoria the production of wool from 11,913,290 head of sheep amounted, in 1860, to 37,082,572 lbs., or 3.1 English pounds per sheep, that colony must possess about 41,935,000 sheep; consequently, nearly half a Prussian hundred-weight was produced to every inhabitant.

The actual number of sheep is probably larger; for in the above-stated average weight of the fleeces at 3.1 English or 2.79 Prussian pounds, there is included a considerable quantity of wool from slaughtered sheep, and a portion of the wool comes unwashed into market, and finally, the fat-tailed Cape sheep furnish much lighter fleeces—only about 1 lb. per head.

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* The imports of Australian wools into England were:

1862	226,915 bales.
1863	246,639 "

Those of Cape wools amounted to:

In 1862	66,841 bales.
1863	68,922 "

In 1863, from the Cape and Australia together, 315,552 bales, or, a bale weighing 300 English pounds, 124,665,600 English or about 112,000,000 Prussian pounds. Thus, our above-stated estimate will very closely approximate the truth.

The production of wool in South America is more difficult to determine than in Australia and South Africa. These two British colonies export most of their wools to the mother country; but South America stands in more direct connection with North America, Germany and France, especially with the two first named countries, of which Germany consumes the largest portion of the cattle and horse hides produced in those regions in immense quantities.

The shipments are made from various ports; from Callao, Valparaiso, Buenos Ayres, Montevideo, &c., and the connections are often interrupted by the continual civil wars.

Yet in these grassy regions, destitute of trees and watered by mighty streams, formerly devoted only to horse and cattle breeding, we see the breeding of sheep rapidly progress; and they are the very districts which alone furnish the highly valued alpaca and vicuna wools.

From these countries England imported the following quantities of wools of all kinds, including alpacas:

1847	7,295,550	lbs.
1851	4,850,048	"
1853	9,740,032	"
1854	6,134,334	"
1858	10,046.381	"
1859	9,759,779	"
1860	8,950,629	"
1861	12,351,777	"
1862, from the La Plata River	10,032	bales.
1863 do	14,731	"
1862, from Peru	44,373	"
1863 do	40,343	"
1862, Alpaca regions	25,570	"
1863 do	34,877	"

When we compare with these figures the quantities shipped from Buenos Ayres alone, the only harbor of which lists of exports lie before us, direct to North America, we find the amounts of shipments from that one port to be:

In 1847,	5,313,000	lbs.	Of these went to North America...	1,362,823	lbs.
1848,	13,820,321	"	do do	7,886,406	"
1849,	17,495,590	"	do do	10,934,226	"
1850,	13,843,386	"	do do	8,611,320	"
1854,	6,735,000	"		——	
1859,	14,635,200	"		——	

Now, England imported from all South America in 1859 only 9,759,779 lbs. of wool; thus, she receives only a small portion of South American wools; of those of the Argentine States only about one-twelfth, for Buenos Ayres exported in 1848, 13,820,321 lbs. of wool;

Of these went to England	1,006,516 lbs.
to North America	7,886,406 "
to Germany and France	4,927,399 "

The same is the case with the republic of Uruguay, Chili, Peru and Brazils, which shipped, in 1848, to England:

Montevideo	3,251,563 lbs.
Peru	2,375,783 "
Chili	655,522 "
Brazils	60,457 "

Including the alpaca wool, the imports of which into England amounted in 1849 to 1,655,300 lbs.

Now, since Buenos Ayres and Montevideo export only about one-twelfth of their wools to England, but Peru and Chili the largest portion of their wools direct to England, the estimate will not be too low when we say that England receives, on an average, 33⅓ per cent. of the South American wools. If this estimate is correct, the production of wool in these States amounted, in 1861, to about 37,000,000 lbs., and presently it amounts to about 44,400,000 English or 40,000,000 Prussian pounds.

Here we remark that the Falkland Isles, with about 30,000 sheep, are now also numbered among the wool-producing countries; that Darwin found the Guanaco on various isles of Terra del Fuego, which, therefore, are likewise adapted to the production of wool; and that particularly the southern extremity of America, from the Rio Grande do Sul southward, seems to be very well adapted to the keeping of sheep.

These countries, especially Uruguay, the Argentine Republic, and the southern portion of Entre Rios, lie under the isothermes most favorable to sheep breeding; they consist of very extensive grass plains, with timber growing only along the water-courses; they contain no waste deserts, like Australia and the Cape of Good Hope, and do not suffer from a troublesome want of water like those two British colonies; they are easily accessible from the sea, and intersected by many navigable streams; they possess a healthy climate; they lie much nearer to Europe than the Cape and Australia, for the vessels from the Cape must pass near Brazils, in order to cross the equator under favorable conditions; and finally, they have already an extensive commercial connection with Germany.

To these countries, and particularly to Uruguay, the German sheep breeders, colonists and manufacturers have to look, in order to find a market for their breeding animals and manufactures, and a rich source whence they may get their necessary supply, which domestic production can no longer furnish.

Thus, we have found the aggregate production in the southern hemisphere to be:

1. In the British colonies	117,000,000 Prussian lbs.
2. In South America	40,000,000 " "
Total	157,000,000 lbs. of wool.

These quantities are all shipped to the northern hemisphere, and the freight, at one-half silver groshen per pound, amounts to about 2,500,000 thalers.

In the third part of this essay, treating on the consumption of wool, we shall find that, besides the wool produced by herself—

England consumes about	75,000,000	lbs. of wool.
France	45,000,000	"
Germany and Belgium	50,000,000	"
America	50,000,000	"
Total	220,000,000	"

Of this aggregate the southern hemisphere furnishes 157,000,000 lbs.; thus, there are 63,000,000 lbs. to come from other countries. Now, since the consumption of wool does continually increase with the increasing wealth of a nation, since new markets for European woolen wares have been opened in Japan and China, and finally, since with the growing population and the rapidly increasing wealth of the southern hemisphere a larger supply of woolen goods is required, there is still a vast field open to the production of wool, particularly of wools of medium quality, which are no article of luxury, and there is no reason for the apprehension that the market will soon be overfilled.

Further, when we hear wailing complaints that Germany now sends proportionately less wool to England than formerly, we must consider this an erroneous view of the thing.

We do not produce wool enough in Germany to feed our own manufactories; we ship to England only those qualities which are wanting there, and we receive in exchange for the same mostly such as we want, e. g., comb wools and comb wool yarn. But since every pound of wool is worth from three to five times more after it is manufactured than before, it is a good sign that we are now able to consume not only our own, but also a considerable quantity of foreign wool; for the increase in the value of wool by its manufacture is a gain to that country by whose working power it is caused.

After this digression—which we deemed necessary, because the bugbear of the production of wool in Australia, at the Cape, and in South America, is constantly kept before the eye of the German sheep breeder—we leave the southern hemisphere and turn to the northern, in order to approximately ascertain how much wool may be produced in the same.

Here there prevail much more intricate conditions, rendering it more difficult to draw a general picture approximating the truth; yet we are not deterred, hoping that men of greater scientific attainments, with ampler sources at their command, may in future put more correct figures into our rough and still imperfect frame, so that the truth may be gradually ascertained, as far as it is necessary.

Even the most uncivilized countries of the northern zone, e. g., Morocco, Algiers, Tunis, the Turkish possessions, and the highlands of Asia, possess an extensive woolen manufacture, and their productions supply not only their own domestic markets, but a portion of them is also exported. The quantities of wool thrown into market and shipped to the great manufacturing States, which, therefore, may be determined, is proportionately small in those States, in comparison to their domestic consumption.

Yet the woolen goods manufactured in those uncivilized countries form an important item in commerce, as we shall see afterwards; but here we will only mention the carpet cloths of Turkey, the red woolen caps and "burnus" of Tunis, the carpets of Asia Minor, the shawls of Angora and Cashmere.

There are but comparatively few statistic dates, and estimations have to take their place. Whenever our estimates may appear improbable to the kind reader, we shall gratefully receive any correction.

We begin our review with England, the great commercial emporium, taking also a prominent place in the production of wool.

In the year 1699, the number of sheep in England and Wales, excluding Ireland and Scotland, amounted to 12,000,000 head.

In 1800, Mr. Succok estimated the production of the British flocks at 384,000 bales, at 240 English pounds, or 92,544,000 pounds.

In 1828, Mr. Hubbard declared this estimate to be approximately correct, and he himself sets the production for 1828 down, at least, at 463,169 bales, or 111,623,729 English pounds.

Mr. Culloch estimates the production in 1846 at 540,000 bales, or 130,140,000 English pounds.

Porter, extending his surveys also to Scotland and Ireland, sets down the production for 1845—

In England and Wales at	145,724,000 lbs.
In Ireland at	12,000,000 "
In Scotland at	20,000,000 "
Total	177,724,000 "

Thomas Southey, in "The Rise, Progress, and Present State of Colonial Sheep and Wools," gives the following estimate for England, Scotland and Wales, in 1850:

40,000,000 sheep, and
15,000,000 fleeces from slaughtered sheep.

Total, 55,000,000 fleeces, at 5 lbs. = 275,000,000 lbs.

In 1851, Mr. Block estimates the number of sheep in England and Wales at 32,000,000 head, which, if Scotland be added, will approximate Southey's estimate.

If we adopt Southey's figures, being probably too low,* and add yet 15,000,000 for Ireland, we have, for Great Britain, the enormous production of wool of 290,000,000 English or 260,000,000 Prussian pounds, an amount surpassing the total production of the southern hemisphere by 93,000,000 Prussian pounds, and more than double the entire production at the Cape and in Australia; and also about double the amount of the entire imports of wool into England, amounting to about 135,000,000 Prussian pounds.

These figures are astonishing; but if we consider the large consumption of mutton—London alone consumes annually about 1,500,000 sheep—and if we further consider that nine-tenths of the sheep raised in England are comb wool sheep, it will not appear to be far from the truth.

According to Mr. Block, France, in 1851, possessed 32,150,000 sheep, and we believe not to be mistaken, if we presume that sheep breeding having found favor in the eyes of the Frenchmen, this number has at the present time increased to........................ 36,000,000
Hereto add the fleeces of slaughtered sheep....... 5,000,000

Total.................................. 41,000,000 fleeces, at a general average weight of 3 Prussian pounds.

Consequently, the production of wool in France amounts to 123,000,000 Prussian pounds.

In Germany and Belgium, including Holland, the number of sheep amounts, in round numbers, to:

1.	Austria	34,000,000	head.
2.	Prussia	17,500,000	"
3.	Bavaria	2,000,000	"
4.	Baden	190,000	"
5.	Hanover	1,700,000	"
6.	Mecklenburg	1,200,000	"
7.	Saxony	590,000	"
8.	Wirttemberg	680,000	"
9.	Hesse	780,000	"
10.	Smaller German States	2,000,000	"
11.	Holstein	320,000	"
12.	Belgium	600,000	"
13.	Netherlands	600,000	"
	Total	62,160,000	"
	Thereto come yet	9,324,000	fleeces from slaughtered sheep.

Aggregate.......................... 71,484,000 fleeces, at 2.75 lbs., make 196,581,000 lbs. of wool as the production of the Central European

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* In 1842, McQueen estimated the number of sheep in Great Britain and Ireland at 50,000,000 head, which seems to be too high an estimate at that time.

States, where the weight of the fleece is smallest, because they produce the finest wool.

In 1845, Porter estimated the amount of wool produced at 180,000,000 English pounds. Since that time the breeders have paid more attention to quantity; the number of pounds determined by us, 196,581,000 lbs., or in round figures, 200,000,000 lbs., will come pretty near the truth.

The production of wool in the Central European States, in which, being the nearest to us, we take most interest, surpasses the aggregate production of Australia, the Cape and South America, by nearly 43,000,000 lbs., and yet is insufficient to feed our domestic manufactories.

Portugal possesses 5,000,000 sheep; added to these 15 per cent. of fleeces from slaughtered sheep = 725,000, gives a total of 5,725,000 fleeces, at 3 lbs., which makes 17,175,000 lbs. of wool as the production of this country.

Spain has 18,000,000 sheep; hereto add 15 per cent. of fleeces from slaughtered sheep = 2,700,000 fleeces, which gives 20,700,000 fleeces, at 3 lbs., or 62,100,000 lbs. of wool for this country.

Italy. The statistical appendix to the official catalogue for 1862 sets the production of wool in 1861 down at 40,000,000 lbs.

Switzerland. This country possesses about 550,000 coarse wooled sheep; to these add 15 per cent. of pelts = 82,500, which makes an aggregate of 632,000 fleeces, at 3 lbs. = 1,896,000 lbs. of wool.

Greece has 2,600,000 sheep, and produces about 7,800,000 lbs. of wool. Of pelt and tanyard wool there is only a very small quantity produced in this country, since the pelts are mostly used there, and in the following countries, for fur.

European Turkey, with *Moldan* and *Walachia*, has 14,300,000 sheep, at 3 lbs., making 42,000,000 lbs. for these countries.

European Russia had, according to Reden, in 1846,

34,021,715 coarse sheep.
7,652,360 fine “

Total, 41,674,075 head of sheep,* and 48,095 head of camels.

The number of sheep has surely increased since that time; but we will take the above number as correct, and because a sheep will, on an average, bear 3 lbs. and a camel 10 lbs. of wool, we may estimate the amount of wool produced in European Russia at

125,022,225 lbs. of sheep, and
480,095 lbs. of camel's wool, or a

Total of 125,502,320 lbs. of wool.

Sweden and *Norway* have 2,854,180 coarse sheep, at 4 lbs., and thus produce 11,416,720 lbs. of coarse comb wool.

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*Without Poland and Finland which, having 3,500,000 sheep, at 2½ lbs., produce 8,750, [illegible] wool; these are not included in the above.

Denmark, with the *Faroe Isles* and *Iceland*, having 1,200,000 sheep, likewise at 4 lbs. per head, produces 4,800,000 lbs. of wool.

Accordingly, the aggregate production of wool in Europe would amount to:

1.	England	260,000,000	Prussian pounds.
2.	France	123,000,000	"
3.	Germany, the Netherlands and Belgium	196,581,000	"
4.	Portugal	57,175,000	"
5.	Spain	62,100,000	"
6.	Italy	40,000,000	"
7.	Switzerland	1,896,000	"
8.	Greece	7,800,000	"
9.	European Turkey	42,900,000	"
10.	European Russia	125,502,000	"
11.	Sweden and Norway	11,416,000	"
12.	Denmark	4,800,000	"
	Total	893,270,000	lbs. of wool.

These figures representing a quantity nearly six times as large as that produced by all the countries of the southern hemisphere, fall probably yet short of the truth, because the statistical dates in respect to the number of sheep in European Russia are very low, as, for instance, statements of the number of sheep show it to be 60,000,000 head; and Turkey possesses surely more sheep than the number stated above.* But at all events, they convey an idea of the immense production of this clothing material in Europe, so that the farmer will no more be so greatly astonished at the 135,000,000 Prussian pounds of wool brought into the wool market of the world—England, an English pound being one-tenth less than a Prussian.

From Europe we turn to North America, where the United States form a large wool-producing and consuming territory.

The United States of North America were, in the year 1850, in possession of 21,620,482 head of sheep. Since that time sheep-breeding has decreased in the East, in the older so-called New England States, but it increases the more in the grassy prairies of the West—in Wisconsin, Iowa and Texas, where timber is not growing as generally as in the East, but more confined to the banks of the rivers, as in the pampas of South America.

In 1861 the United States had 30,268,674 sheep, which, if we set the average weight of fleeces down at 3 lbs., produced 90,806,022 lbs. But there sheep-breeding has always received more and more attention, and astonishing results have been obtained, particularly in respect to heavy fleeces. There, Merino stock flocks, which, by an average weight of body of only 60 lbs., are said to have yielded 6 lbs. of wool. Now, since the sheep-breeding West has not been the scene of the present civil war, the actual production of wool doubtless amounts to 95,000,000 lbs.

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* Little Montenegro alone exports annually 140,000 smoked wethers, and 30,000 smoked goats, (called Castradina) to Cattaro, in Dalmatia.

The British possessions in North America, of which we mention Nova Scotia, New Brunswick, the Prince Edward Isles, and the southern portions of the Canadas, are not extensively engaged in sheep-breeding. They keep mostly comb wool sheep, while the United States produce noble wools.

The Prince Edward Isles, having 80,859 inhabitants, export, on an average, annually, 800 sheep, 7,230 pelts, and 14,000 lbs of wool, but consume, like Nova Scotia, a large portion of the wool they produce. If we presume that 10 per cent. of the sheep are slaughtered or exported every year, the actual number of sheep would be 80,000, producing about 240,000 lbs. of wool.

Nova Scotia, with 332,264 inhabitants, manufactures 6 ells of coarse woolen stuffs to each inhabitant. This would be a similar proportion in the number of sheep like in the Prince Edward Isles, or about 332,000 head of sheep, with 1,328,000 lbs. of wool.

Now, as exactly the same conditions prevail in both the Canadas and New Brunswick, we believe to be partly correct in estimating the aggregate production of British possessions in North America at 12,000,000 lbs. of wool.

Northern Mexico produces but little wool, although she is well adapted to sheep breeding. Her production amounts, at most, to 200,000 lbs.

The aggregate production of North America would therefore be:

1. United States	95,000,000	lbs.
2. British possessions	12,000,000	"
3. Northern Mexico	200,000	"
Total	107,200,000	lbs.

Now let us return again to the old world, and particularly to North Africa.

The only pretty reliable dates in respect to the production of wool in those regions are found for Algiers. Having about 3,000,000 of inhabitants, and 6,875,894 sheep, which may now have increased to about 9,000,000, and which, since not all sheep are shearable, may be presumed to yield only 2 lbs. per head, she produces about 18,000,000 lbs. of wool. Of these, more than 9,800,000 are exported, and thus not quite one-half consumed in the country. About one-third of the exported wool being comb wool, is shipped to France; 6,000,000 to Tunis and Morocco, especially to the former place, where an extensive woolen manufacture is carried on, which is celebrated in all the Orient for its beautiful red woolen caps, called Fez, and for the fine and nice burnus and haiks.

Thus we see that there come to every inhabitant about 3 sheep and 6 lbs. of wool, of which he consumes 3 lbs. This is in perfect harmony with the Mohammedan faith of the inhabitants, and the extensive pasture lands and large consumption of woolen stuffs by the Arabian population.

Quite similar conditions prevail in Tunis, but she does not export any wool, but consumes yet a considerable quantity of imported wool. Having an area of 3,710 square miles and 800,000 inhabitants, we may safely presume that she produces 4,800,000 lbs. of wool.

Also Tripoli, with 14,070 geographical square miles and about 1,500,000 inhabitants, presents similar conditions, but she exports a portion of her wools by way of Egypt. We may estimate her production at 9,000,000 pounds.

Morocco, whose number of inhabitants is variously stated to be between 5,000,000 and 10,000,000, contains many districts that are not adapted to the production of wool; yet she has a pretty extensive woolen manufacture, and exports some wool—about 100,000 lbs. to England and North America. Confining ourselves to the northern portion of the country, we estimate her production of wool at 12,000,000 lbs.

The production of wool in Egypt (in the valley of the Nile no sheep are kept) is confined to the flocks of the Arabs roaming over the deserts. She exports between 500,000 and 600,000 lbs. of wool. Having an area of 27,160 square miles and 3,380,000 inhabitants, her production may at most be set down at 5,500,000 lbs.

Thus we have in North Africa a production of wool amounting to:

1. Algiers	18,000,000	lbs.
2. Tunis	4,800,000	"
3. Tripoli	9,000,000	"
4. Morocco	12,000,000	"
5. Egypt	5,500,000	"
Total	49,300,000	lbs.

Of these about 5,000,000 lbs. come as wool into European and American markets. The balance is consumed at home, or exported in the form of fabrics.

Now we come to Asia, and there first to the Turkish possessions. They consist of—

1. Asia Minor and Cyprus, with	9,800	sq. miles and	10,700,000	inhabitants.
2. Armenia and Kurdistan, with	5,690	"	1,700,000	"
3. Syria, with	6,870	"	2,750,000	"
4. Arabia, with	9,110	"	900,000	"
Total	31,470	sq. miles and	16,500,000	inhabitants.

All these countries have a large number of sheep, and also Mohair and Angora goats bearing wool; besides, they produce considerable quantities of camel hair, and are pretty extensively engaged in woolen manufactures, and export considerable quantities of raw material. We may, therefore, presume a considerable production of wool.

A few figures will show the extension of the woolen manufacture.

Angora and vicinity manufacture annually more than 40,000 pieces of camelot, sersh and shawls, which find a market within the Turkish empire; and they export to England alone about 3,000,000 lbs. of goats' hair, and a still larger quantity to France, Germany and America.

In 1840, while England imported only about 300,000 lbs. of wool from Turkey and Syria, the United States of North America alone received 5,744,328 lbs.

Asia Minor furnishes an immense number of carpets—finding, as prayer carpets, divan coverlets and blankets, an extensive market in the Turkish empire; and the heavy felt garments of the people of Kurdistan, and the tents of the nomadizing shepherds, require large quantities of common wool.

Now, if we presume a production of 6 lbs. of wool to every inhabitant, like in Algiers, which is certainly a minimum estimate, we find in these countries a production of wool amounting to 96,300,000 lbs., or in round numbers, to 100,000,000 lbs.

Similar conditions prevail in the northern portion of Persia, and we may estimate the production of wool in this country, having an area of 26,450 square miles, and 10,000,000 of inhabitants, at 50,000,000 lbs.

Asiatic Russia possesses about 20,000,000 head of sheep and about 150,000 camels; she must, therefore, produce about 60,000,000 lbs. of wool.

The following countries, Herat, with 1,500,000 inhabitants, renowned for her manufacture of woolen stuffs and carpets; Kelat, Mekran, Buchara, renowned for her black pelts from Karakul and her camel's wool; Hissar, Schehrsaber, Kundus, Chokand, Derwazeh, Cafferistan, Karatzin, Chiwa, the Turcomans and Karakirghese, having 10,000,000 of inhabitants and keeping large numbers of sheep, goats and camels, we presume to produce 60,000,000 lbs. of wool.

We know nothing of the production of wool in the interior of Asia, but we know that from the valleys of the Himalaya mountains and the northern portions of the East Indies, about 20,000,000 lbs. are shipped to England, that the people there wear mostly woolen garments, that the population of the highlands of Central Asia is pretty numerous, and that, of late, wool has been exported from China to the United States of North America.

The population of the entire Chinese empire is set down at 400,000,000 souls, among whom we will number the people living on the southern slope of the Himalaya mountains. If we presume the production of wool to amount to ½ lb. for each inhabitant, we have 200,000,000 lbs., of which

20,000,000 are exported, and 180,000,000 remain for domestic manufactures. Now, if we presume that the inhabitants of Mongolia and the highlands of Thibet, where the climate is cold and woolen clothes are generally worn, require 3 lbs. of wool for each person, it would give 60,000,000 of inhabitants for these countries, while there remain 340,000,000 Chinese who do not consume any wool. This approximates the truth very closely, and our estimates would seem to be pretty correct.

Japan and the Islands of North Asia, possess no sheep, and, therefore, produce no wool.

Thus, the aggregate production of Asia would be:

1. Asiatic Turkey	100,000,000 lbs.
2. Persia	50,000,000 "
3. Asiatic Russia	60,000,000 "
4. The smaller Asiatic countries	60,000,000 "
5. Thibet and Mongolia	200,000,000 "
Total	470,000,000 "

Having now finished our general survey, we may recapitulate the aggregate production of wool on earth:

I. The southern hemisphere furnishes	157,000,000 "
II. The northern hemisphere:	
a. Europe	893,270,000 "
b. North America	107,200,000 "
c. North Africa	49,300,000 "
d. Asia	470,000,000 "
Total	1,676,770,000 "

Or if we presume the population of the zones adapted to the production of wool to be 840,000,000 souls, nearly 2 lbs. of wool to each inhabitant.

But as about 360,000,000 Chinese and Japanese consume nearly no wool at all, the remaining 480,000,000 have a large quantum to consume, and there is a surplus of woolen goods, which is shipped to the regions producing no wool, such as the East Indies, the negro countries and tropic America.

Although our figures may not be correct in some respects, but in their aggregate they give the husbandman an idea of the great value of the production of wool to the world. At the rate of 10 silver groshen per pound, it represents a yearly production of 558,923,000 thalers, or at the rate of 5 per cent., the interests on a capital of 11,178,460,000 thalers.

But the woolen goods manufactured annually, increasing the value of wool from three to five-fold, are worth from 1,676,769,000 to 2,794,615,000 thalers, with which the entire public debt of England might be paid in two or three years.

NOTE.—The Prussian pound is one-tenth less than the English or *avoirdupois* pound.

REPORT OF COMMITTEE ON SHEEP,

AT THE STATE FAIR, 1864.

[The following report was received too late for insertion at the proper place, and the pedigrees and engravings of the premium and commended sheep were withheld for the report. See page 104 for premiums awarded.]

To the Ohio State Board of Agriculture:

GENTLEMEN,—Having been appointed by your honorable body as a committee on Merino sheep, at the Fair for 1864, we would respectfully submit the following report:

On arriving at the fair-grounds, we found upon exhibition the very respectable number of two hundred and seventy-two Merino sheep; and seeing at a glance that a large proportion of them were of superior quality, and that the competition promised to be very close, we determined to make the best of our opportunity, and immediately commenced an informal but very careful examination of all the sheep entered in our department, taking separate and individual notes. On comparing these notes, we found a remarkable unanimity of opinion as to the comparative merits of different animals.

While we wish to bear testimony to the great excellence of very many of the sheep on exhibition, yet so far as the awarding of premiums was concerned our further examination was confined to a comparatively small number; but in this examination no animal that stood comparatively well in the estimation of any individual of the committee was overlooked.

Our regular examination was first directed to the class of "rams, 2 years old and over," of which there were sixteen entries. Of these about one-half were well worthy of commendation; but in the performance of the special duty assigned us, we give it as our opinion that the ram exhibited by J. S. Delano, of Knox county, and known to us as the "Sanford Ram," possessed more valuable points as a "stock buck" than any other one on exhibition in this class. We are well aware that, of the others, some excelled in certain points, but this one, having good size, fair form, good length of staple, with extraordinary density of wool, of beautiful style, with fine oil, fleece extending unusually well upon the belly and legs, excells in a combination of those points which are desirable, and which go to make up what we call character, or decided type, and which we wish to reproduce and perpetuate. To the practiced eye, this ram, although thin in flesh, and not in show condition, conveyed at once the impression that he was a "marked breeder." This ram was sired by Cossett, he by Crop, he by Greesey—dam, by California. First fleece, 22 lbs.; second, 24½ lbs; weight of carcass in lean flesh, 110 lbs.

The second premium was awarded to "Hamburg," owned by S. S. Matthews, of Licking county, Ohio, an animal of superior form and size, with long, elegant staple, and very many excellent points. This noble animal was bred by George Campbell, of Vermont. Weight of second fleece, 20 lbs.; carcass, 145 lbs.

In the class of yearling rams, amongst which we note those of L. J. Wright, of Vermont, Eli Keller, of Licking county, Ohio, and Charles Stoolfire, of Hebron, Ohio, as being superior animals. Keller's young Monitor possesses traits of character and points of development which indicate a dangerous rival for future competition. But the one which most excited our admiration was the ram "Hibbard," exhibited by Eels and Bingham, of Cornwall, Vt. We are not at all blind to the fact that this ram is not without fault, as, for instance, there is a slight depression just back of his shoulders, which, in our opinion, should be full, giving a straight back. It is a question whether he is not *excessivelg* wrinkled, and the wool on the wrinkles is harsher than we admire, while the fleece does not extend as well into the arm-pits and the inside of the thighs and the coupling, as the fancy of many would require. But such is his elegance of form, fine size, strong masculine development, and noble bearing—such the length of his wool, with extreme density, and very good quality, that, in the opinion of your committee, he can carry all his faults and be justly regarded as a remarkable animal, well worthy of the honor of the first premium. Hibbard is from a cross of Hammond and Robison's stock; clipped at one year of age 17 lbs., with weight of carcass 100 lbs. In criticising this sheep, we venture to remark, by way of a passing observation, that your committee deem it very bad policy to run after points of doubtful value, if in doing this we make the least sacrifice in points of essential utility. While noting and speaking of the different striking "points" in this ram, your committee were struck with the remark of an old by-stander, which we deem worthy of a place in this report by way of a hint to young breeders. In a tone of sarcasm and disappointment, he exclaimed: "Points! *points!* Yes, I got my mind set on '*points*' about twenty years ago, and I bred for '*points*' until I hadn't *fleece* enough left to cover the tags!"

We award the second premium to the ram "Prince," exhibited by Messrs. Eels and Bingham.

In the class of "ewes two years old and over," we notice as very worthy those exhibited by Eli Keller, of Newark, Ohio, Perrine and M'Nall, Pa.,

G. W. Pollock, Gratiot, Ohio, Jones and Pinney, Vt., J. N. Wright, Hartford, Ohio, and Casey and Boyce, Bucyrus, Ohio. Of these, we award the first premium to Eli Keller and the second to Perrine and M'Nall. There were very fine individual sheep in the other pens, but, failing in the requisite number of superior ones, they could not be awarded a premium. The sheep of Mr. Pollock deserve especial attention as *wool growers*. While they fail on the face and belly and legs, they are very hard to beat, where the *best* wool grows. These sheep, with those of Mr. Wright, have fine development of *constitution*, which is a "*point*" of first importance.

Our attention was next directed to the class of "yearling ewes," and to them was reserved the honor of surpassing excellence. There were many superior ones, but in this paper we only mention those considered the most deserving; and here the comparison was so close, that we found it difficult to decide. Finally, with tolerable unanimity we awarded the first premium to Eli Keller and the second to J. S. Delano. Your committee expressed mutual regret that such elegant sheep as those of Mr. Delano, with their faultless fleece, should not bear off the first honors. Mr. McFadden, of Harrison county, exhibited some ewes of perhaps equal value; but of superior ones his pen did not show the requiste number.

In the class of lambs, we award the first premium to J. S. Delano, and the second to L. J. Wright, for which we wish to apologize to your honorable body, but beg of you to consider, as extenuating circumstances, the fact that we could not do any better. There were many entries in this class, but we are constrained to say that none of them presented such excellence as that displayed by the yearlings.

In review of the whole subject, we would remark that, while the show of merino sheep was magnificent, and, without question, finer than any previous one in our State, and while there were many excellent sheep which had been raised in Ohio, yet most of these, of the older classes, which were considered the best, were raised, or at least bred outside of the State. We take pleasure in referring to the very creditable exception of Keller's yearlings, which, we understand, were bred and raised in Ohio, as well as a couple of pets shown by Mr. McFadden. The lambs were principally bred within the State, and, as already intimated, were not of great excellence, which proves one of two things, viz: either the best lambs of the State were not on exhibition, or Ohio breeders have not yet reached that proficiency commensurate with the amount of time and money expended. But we should remember that our best purchases of merino stock have been made but recently, and that in the future we may expect to see a great improvement in the lamb department at our fairs. There is no finer field for sheep than Eastern Ohio, and with the stock we now have, and with the amount of capital and enterprise now enlisted in this cause, we expect our flocks to rank with the best.

In closing this report, your committee wish to venture a little outside of their proper place, to make mention of the very beautiful lot of wool exhibited by George W. Pollock, showing conclusively that he must have a very valuable flock of sheep, and knows well how to take care of them.

All of which is respectfully submitted,

S. N. CALDWELL,
Chairman Committee.

SANFORD.

"Sanford," owned by John S. Delano, Mt. Vernon, Ohio, awarded premium for best merino buck two years old and over.

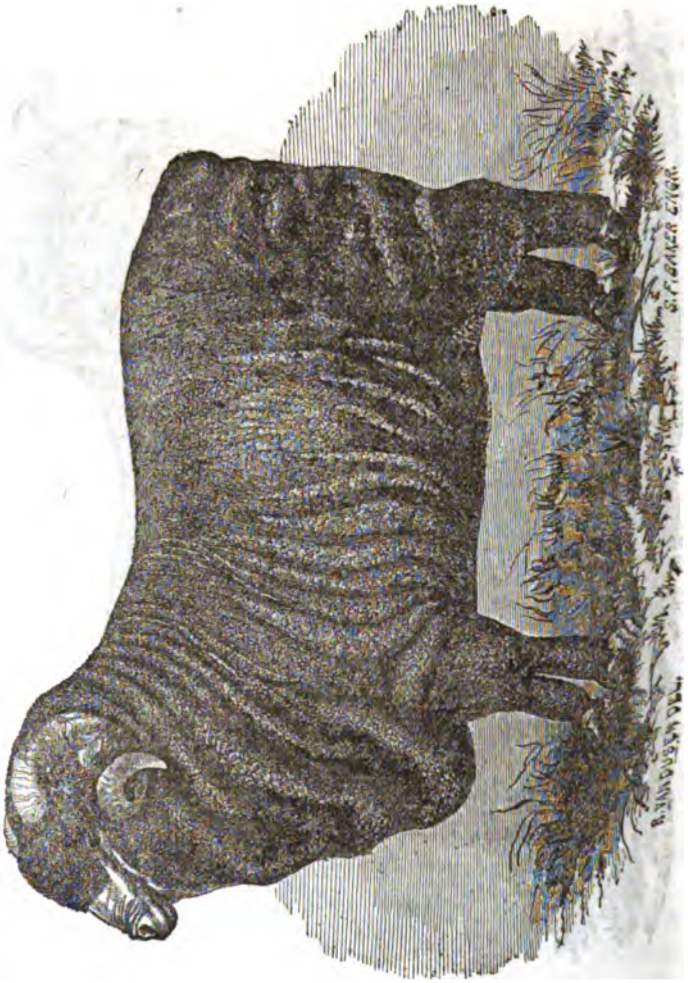
Pedigree.—"Sanford" was bred by Wm. R. Sanford, of Orwell, Vt. He was got by "Cosset," by "Cross Ram," by "Old Greasy" (Hammond's,) by "Wooster," by "Old Black." His dam was by "California" (Victor Wright's,) by "Long Wool" (Hammond's,) by "Old Greasy," by "Wooster," etc.—therefore a pure "Infantado." His second fleece was 22 lbs.; third, 24½; fourth, 23¾: weight of carcass, 105 lbs. He girths four feet and one inch; was four years old last spring; is the sire of some of the best stock in Vermont and Ohio.

"Hamburg," owned by S. S. Matthews, Outville, Licking county, Ohio; awarded premium as second best Merino buck, two years old and over, and first premium on sweepstakes on fine wool sheep.

HAMBURG.

Pedigree.—"Hamburg" was got by "Old Grimes," by "Sweepstakes," etc. Dam got by "Woodstock," by "Wooster," by "Old Black;" grand dam by "Old Pomp," by "Blackhawk," by "Old Black," out of Campbell ewe.

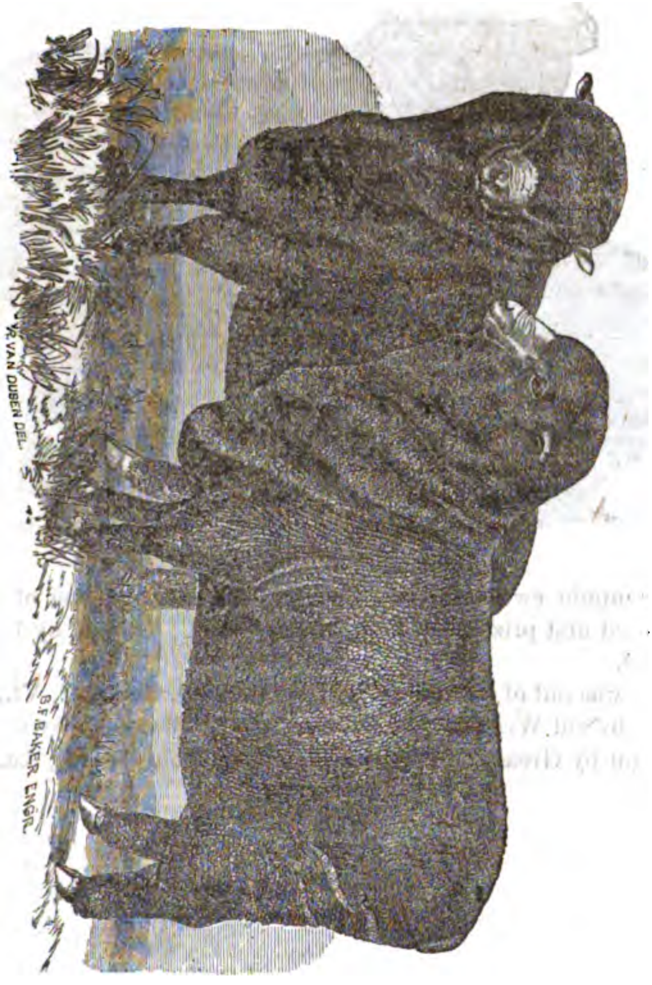
Yearling Merino ram, "Hibbard," now owned by Eli Keller & Co. of Newark, O.; winner of first prize for one-year old rams at the Ohio State Fair for 1864.


R. VAN DOUSEN DEL.
S. F. BAKER ENGR.

HIBBARD.

His sire was bred by H. R. Holden, Middlebury, Vt.; got by "Sweepstakes," out of an Infantado ewe bred by Edwin Hammond, of Middlebury, Vt. His dam was sired by the "Little Robinson Buck," and his grand dam by the "Old Wooster Buck," and out of an Atwood ewe.

Infantado ewes, "Beauty" and "Queen of the West," bred by Edwin Hammond, Middlebury, Vt.; now owned by Eli Keller, Newark, O.


W. VAN DUSEN DEL.
B.F. BAKER. ENGR.

BEAUTY AND QUEEN OF THE WEST.

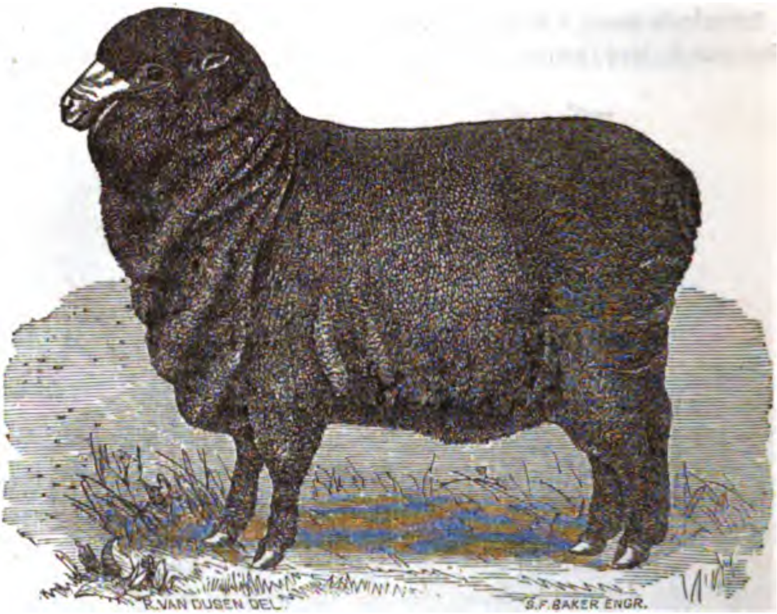
"Beauty," on the right hand, is 6 years old, and one of the five aged ewes who took first premium at Ohio State Fair, 1864.

Got by Little Wrinkly; by old Wrinkly; by old Greasy; by Wooster; by old Black.

"Queen of the West" was out of old Queen; by Long Wool; by old Greasy; by Wooster; by old Black.

Was got by Sweepstakes; by Little Wrinkly; by old Wrinkly; by old Greasy; by Wooster; by old Black.

Awarded first premium for Merino ewes, two years old and over, at the State Fair at Columbus, Sept. 1864.


R. VAN DUSEN DEL.
S. F. BAKER ENGR.

LITTLE PRINCESS.

Infantado ewe, "Little Princess," 4 years old, one of the five ewes awarded first prize at Ohio State Fair, 1864. Owned by E. Keller, Newark, O.

She was out of a ewe bred by Reuben Hall, Cornwall, Vt., by Lawrence ram; by old Wrinkly; by old Greasy; by Wooster; by old Black. She was got by Greasy; by Edwin Hammond's old Greasy, &c., as above.

CHEMISTRY OF CATTLE-FOOD AND FEEDING.

BY ROBERT SCOTT BURN.

It was reserved for modern chemists to show that the chief organic constituents of the animal frame have their representatives in the vegetable kingdom. Thus, the nitrogenised portions of food, the vegetable fibrin, albumen, and caseine, are identical with the animal fibrin, albumen, and caseine. These portions of food in the vegetables go to make up in the animal frame its muscle and flesh. Again, much of the fat or oily matter of the animal has its representative in the vegetable. The modern theory of cattle-feeding owes its enunciation to Liebig. This great teacher of agricultural science points out what, indeed, is evident enough, if we survey in a proper spirit the evidences which every where surround us of the design and care of Him who rules all things well, in every department of nature: that the life and development of our organic being cannot be regarded as at all dependent upon chance. The assimilation of the food of which it partakes, the change of the elements of this food into the bone, blood, flesh, and muscle, which make up the living form, are all governed by laws which play into, and are dependent upon, each other, like the parts of a well-made machine, and give rise to all "vital manifestations, its existence, and continuation" of animal life.

Chemical analysis proves that in the seeds of the cereals, as wheat, barley, and oats, and of leguminous crops, as beans or peas, the sulphur and nitrogenous constituents are always accompanied by alkaline phosphates and alkaline earths, "and that between both there exists in each seed a fixed and unchangeable relation." The sulphur and nitrogenous constituents of the food form the combustible matters of the blood. With the increase or decrease of phosphoric acid in the seeds of the crops named above, there is an increase or decrease in like proportion of the blood-forming constituents. Still further, chemical analysis has shown us, that in the blood of bread-fed men, or seed-fed animals, the incombustible matters are the same as those which are found in the plant. In animals fed on turnips, herbs, or potatoes, the blood ash-constituents are the same as the ash constituents of the plants they consume.

We have already seen how indispensable to the life of the plants are the mineral constituents of the soil. Now, Liebig shows that the mineral elements are just as indispensable to the "life of animals, to the formation of their blood, and to its functions." Of the brain and nerves phosphoric acid is an important constituent; of the flesh, alkaline phosphates and alkaline earths; while phosphate of lime is indispensable for the formation of bone. "The ash of green crops is rich in alkaline carbonate and common salt; and the blood of herbivorous animals abounds in alkaline carbonates. . . . . Were it possible for a plant to grow, flower, and bear seed without the co-operation of mineral matters, it would be utterly valueless to man and animals. A dog will die of hunger in presence of a dish full of raw or boiled white and yelk of eggs in which is wanting one of the substances most important for the formation of blood. The first trial teaches him that such food is as inefficient as a stone for the purposes of nutrition. The constituents of the ashes of turnips and of meadow plants give them their nutritious value. Did they not exist in them, such plants would not be consumed by horses and cows. Every where in nature prevail these harmonious laws which attach life to the earth, and maintain it in perpetual freshness and duration."

All food is capable of being divided into two parts, the inorganic and organic. The inorganic portions are termed the ash or mineral, and are those which are left in burning or consuming the food. The mineral or ash constituents of food are composed of earthy, insoluble matters—principally *lime* and *phosphoric acid*, the uses of which in the animal economy are to supply its bone; *salt, and phosphate of soda*, which enter into the composition of the blood; and the *salts of potash*, which enter largely into the *juices* of the animal frame.

The *organic* or combustible substances of food are divisible into two great classes, the *nitrogenised* and the *non-nitrogenised*. The nitrogenised portions, designated as *albumen*, *casein*, and *fibrin*, are composed of four elements, *carbon*, *hydrogen*, *oxgyen*, and NITROGEN. The non-nitrogenous compounds of food are *gum*, *sugar*, *starch*, *pectin*, and *fat*. In these, nitrogen is never present, only the three elements, carbon, hydrogen, and oxygen.

The office of the *nitrogenised* portions of food is to form the blood and tissue of the animal, that of the *non-nitrogenised* portions to maintain the heat, and to promote the respiratory functions of the animal. Although the plants which serve as the food of the farm-stock are comparatively poor in flesh-forming or nitrogenous compounds, still they play an important part in the animal economy. No food in which they are entirely absent will support animal life for any length of time. Carefully made experiments go to prove that "the animal organism does not possess the power inherent in plants of compounding and preparing the substance of the muscles from its elements;" so that it is absolutely essential that the food of animals shall contain nitrogenous substances, which are, in fact, ready-formed muscle and blood, so to speak.

At one period in the history of the chemical investigation of the food question, the nutritive value of a food was determined by the quantity or proportion of its nitrogenised constituents or flesh-formers. "Only," says Liebig, "those substances are in a strict sense nutritious articles of food, which either contain albumen, or a substance capable of being converted into albumen;" again, "only nitrogenous substances are capable of being converted into blood." Boussingault, on the authority of the celebrated agriculturist Von Shaer, gives a table showing the "relative degree of nutriment afforded by various plants to cattle, and then places by the side of it a statement of the proportion of azote present in them" —all going to prove the "dependence of the nutritive quantities of various articles of food upon the proportion of nitrogen in them." The following is the table:

	Nutriment equivalent.	Azote.
Ordinary Hay	100	0·0118
Red Clover	90	0·0176
Beans	83	0·0141
Wheat Straw	400	0·0020
Potatoes	200	0·0037
Beet	397	0·0026
Maize	59	0·0164
Barley	54	0·0176
Wheat	27	0·0213

We shall see, however, as we proceed, that the opinions of chemists are now very much modified as to the nutritive value of a food being determined by the proportion of its nitrogenous constituents. It will be necessary here to state, in order to avoid any confusion of terms, that the nitrogenised portions of food are sometimes called the "albuninous compounds," sometimes the "protein compounds," Mulder having shown that they are all compounds of protein; so that, in the technical language of the chemistry of food, "nitrogenized compounds," "flesh-formers," "*albumenised*" and "protein compounds," all denote the same thing.

The office of the *non-nitrogenised* substances of food—the starch, sugar and gum—is, as we have already pointed out, to promote respiration; although, if these are taken largely, the excess goes to form fat; the fatty and oily matters maintaining the animal heat, and producing fat. From these offices arise the names which are sometimes given to *non-nitrogenised* substances, as "heat-givers," "respiratory compounds," and "carbonaceous compounds." Dr. Lankester likens the non-nitrogenised portions of food to the "*fuel* which keeps up animal heat. The body of a man has a temperature of 98° Fahrenheit. This warmth results from the burning of these substances, which produce as much heat in the body as they would if burned in an open fire out of the body. A man inhales about 3,000 gallons of air in twenty-four hours, in order to burn the daily amount of food-fuel, containing about ten ounces of carbon or charcoal.

The products of combustion pass out by the mouth, just as they would fly up the chimney of an open fire were the charcoal burned in it. Less food-fuel is required in hot weather than in cold; and less in hot climates than in cold ones. Tropical food contains about twenty to thirty parts in the 100 of charcoal; arctic blubber and fats, from eighty to ninety. The intense cold of the polar regions compels the inhabitants to devour large quantities of food-fuel to keep up the heat of the body to 98°. Arctic travelers state that 20 lbs. of blubber is not an uncommon meal for one person."

Dr. Playfair compares the consumption of food in the body to the consumption of fuel in a furnace. "The body," he says, "is the furnace, the food is the fuel, the excrements are the ashes, and the gases respired from the mouth are of the same composition as those which fly up the chimney of the furnace." Of course, burning or consumption, as here spoken of, simply means oxidation; as when we say a metal is burned by rust, it means that the oxygen of the air has combined with the iron, and gradually consumed it.

The following is the summing up of Dr. Voelcker as to the two great classes of food substances:—

NITROGENOUS COMPOUNDS.

Vegetable albumen.—A substance identical in composition with the white of egg.

Vegetable fibrin, or gluten.—A compound occurring in considerable quantity in wheat, and giving elasticity to the dough made with wheaten flour.

Vegetable caseine.—A substance identical in composition with the curd of milk.

Legumin.—A peculiar vegetable principle which derives its name from its occurrence in large quantities in pease, beans, and other leguminous seeds.

There are other substances, but in such small proportion or of such rare occurrence as to require no special mention.*

NON-NITROGENOUS COMPOUNDS.

All oily and fatty matters; starch, or amyline.—Which constitutes the principal part of wheaten flour, oat and barley meal, rice, Indian corn, and the dry matter of potatoes.

Sugar.—Which abounds in mangelds, carrots, and turnips.

Gum and mucilage.—Constituents of every kind of food.

Pectin.—The jelly-like substance which is found in carrots, mangolds, turnips, and many other bulbous roots.

Cellular and woody fibre.—Substances which constitute chiefly the bulk of straw and hay, and occur abundantly in every other vegetable produce.

With these views of the chemistry of the various kinds of food, it has been a matter of no small importance to have analyses of them, showing their constituents, so as to enable any one of them to be valued as a food.

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* It is right to state here that some chemists hold, with Mulder, that vegetable albumen and caseine are *not* identical.

The number of analyses taken of foods has been very great, and in this department the services rendered by Drs. Voelcker and Lankester have been extremely valuable. As in a former division we have given analyses showing the nominal constituents of the cereals, root crops, &c., so now we give analyses showing their nutritive constituents.

THE GRAINS OF THE CEREALS.

Constituents.	Wheat.	Barley.	Oats.	Rye.	Maize or Indian Corn.	Buck-wheat.
Water	12·26	14·65	13·09	13·00	14·96	14·2
Flesh-formers	11·64	10·84	11·85	13·83	11·27	8·6
Heat and fat-producers	68·74	68·71	63·34	71·50	67·48	75·4
Woody fibre	2·61	3·45	9·00	10·29	5 02	20·6
Ash	1·75	2·75	2·72	1·7	1 27	1·8

THE STRAW OF THE CEREALS.

Constituents.	Wheat.	Barley.	Oats.	Rye.
Water	14·23	14·30	12·06	14·30
Flesh-formers	1·79	1·68	1·63	2·29
Heat and fat-producers	31·06	39·98	39·98	37·15
Woody fibre	45·45	39·90	39·80	43·18
Ash	7·47	4·24	4·24	3·08

LEGUMINOUS SEEDS.

Constituents.	Beans.	Peas.	Lentils.
Water	14·8	14·1	12·5
Flesh-formers	23·3	23·4	24·0
Fatty matters	48·5	50 0	52·0
Woody fibre	10·0	10·0	9·0
Ash	3·4	3·4	2·5

STRAW OF THE LEGUMINOUS PLANTS.

Constituents.	Beans.	Peas.
Water	2·90	12·00
Flesh-formers	6·79	12·55
Fatty matters	65·96	21·93
Woody fibre	—	47·52
Ash	6·35	6·00

REFUSE OF THE CEREALS AND LEGUMINOUS SEEDS.

Constituents.	Bran.	Malt-dust.	Oat-dust.	Brose-meal Brock.	Pea-hulls from Maple Peas.	Barley-dust.	Rice-dust.
Water	12·86	6·24	9·31	9·12	10·12	11·03	12·02
Flesh-formers	13·80	25·62	6·92	10·66	5·64	8·46	6·09
Oil	5·56		3·21	1·65	0·66	3·47	5·61
Woody fibre	11·50	59·44					36·67
Starch gum	50·17		72·86	75·08	80·21	69·73	25·52
Ash	6·11	8·70	7·70	3·49	3·37	7·31	13 49

ROOTS.

Constituents.	Swede.	Mangold.	White Globe.	Aberdeen Yellow.
Water	89·40	87·78	90·43	90·57
Flesh-formers	1·44	1·54	1·14	1·80
Fatty matters	not deter.	—	not deter.	·441
Sugar, pectine, gum	5·93	8·60	2·96	4·181
Woody fibre	2·54	1·12	2·000	2·349
Ash	·62	·96	1·021	·649

POTATOES.

Water	75·2
Flesh-formers	1·4
Heat and fat-formers	22·5
Ash	0·9

CARROTS.

Water	82·03
Flesh-formers	1·21
Heat and fat-producers	7·0
Woody fibre	8·02
Ash	1·04

PARSNIPS.

Water	87·5
Flesh-formers	0·6
Heat-producers	6·6
Woody fibre	3·3
Ash	1·0

KOHL-RABI.

Constituents.	Green Top.	Purple Top.
Water	86·020	89·002
Oil	·227	·177
Soluble proteine compounds	2·506	2·006
Sugar-gum, proteine	6·007	4·486
Salts soluble in water	·970	·919
Insoluble proteine compounds	·300	·269
Digestible fibre and insoluble pectinous compounds	2·933	1·896
Woody fibre, cellulose	1·230	1·106
Ash	·167	·139

LEAF AND FORAGE CROPS.

Constituents.	Cabbage.	Rape.	Leaves of Mangolds	Leaves of Swedes.	Hay.	Green Rye.
Water	86·28	87·05	91·96	88·36	14·61	75·42
Flesh-formers	4·75	3·13	1·76	2·08	8·44	2·70
Heat-producers	7·10	4·64	4·98	7·25	33·63	10·02
Ash	1·87	1·60	1·29	2·29	6·16	1·35
Woody fibre	—	3·56	—	—	27·16	10·48

CLOVER HAY, AND HAY OF ARTIFCIAL GRASSES.

Constituents.	Red Clover (*Trifolium pratense.*)	Purple Clover (*Trifolium pratense perenne.*)	Crimson Clover (*Trifolium incarnatum.*)	Cow-grass (*Trifolium medium.*)	Hop Trefoil (*Trifolium procumbens.*)	White Clover (*Trifolium repens.*)	Common Vetch (*Vicia Sativa.*)	Bush Vetch (*Vicia sepium.*)	Sainfoin (*Onybrychis sativa.*)	Lucerne (*Medicago sativa.*)	Yellow Clover (*Medicago lupulina.*)	Rib Grass (*Plantago lanceolata.*)	Burnet (*Poterium sanguisorbis.*)	Millefoil (*Achillea millefolium.*)
Water	16·6	16·6	16·6	16·6	16·6	16·6	16·6	16·6	16·6	16·6	16·6	16·6	16·6	16·6
Ash	7·97	6·96	8·15	9·67	6·94	8·57	5·42	8·21	6·56	8·42	9·03	7·23	6·64	7·50
Woody fibre	16·46	21·63	26·99	20·12	18·88	22·11	22·82	25·87	20·59	20·51	22·66	27·56	19·89	27·24
Fatty matter	3·06	3·41	3·11	2·97	3·89	3·65	2·55	2·40	2·51	2·30	3·38	3·06	3·34	2·09
Respiratory	37·06	35·35	31·25	30·30	36·55	33·37	32·87	27·62	38·30	33·47	27·76	33·58	39·50	37·88
Flesh-formers	18·79	15·98	13·83	20·27	17·07	15·63	19·68	19·23	15·38	10·63	20·50	11·91	13·96	8·63

Oil-Cakes.

Constituents.	Linseed cake.	Rape cake.	Cotton seed cake.
Water	12·14	10·68	11·19
Oil	12·79	11·10	9·08
Flesh-formers	27·28	29·53	25·16
Heat-givers	41·36	40·90	48·93
Ash	6·13	7·79	5·64

"In determining the nutritive values of different foods the great points are," says Dr. Anderson, "the albuminous compounds (flesh-formers), and the fats (the heat-producers)." But, important as it is to know this, "we are still greatly, nay," continues Dr. Anderson, "altogether in the dark as to the *relative* value of these *two classes of substances.*" It is easy to know the quantities of each, but the difficulty is to ascertain the nutritive value due to each constituent, when, as is often the case, "two or more of them occur in the same substance." The following table is given by Dr. Anderson as likely to be of some value in determining the value of different foods:—

Proportion of Albuminous Matter contained in 100 Parts.

Poppy cake	31·46	Linseed	24·44
Rape cake	29·53	Lentils	24·57
Crambolina cake	28·79	Large lentils (Scottish growth)	24·25
Common Scotch tares	28 57	Grey peas	24·25
Hopetoun tares	28·32	Foreign beans	23·49
Linseed cake	29·69	Kidney beans	20·06
Field beans	27·05	Maple peas	19·43
Winter tares (foreign)	26·73	Clover hay (second crop)	13·52
Spring tares (foreign)	26·54	Sunflower seed	12·70
Oats	10·16	Crimson clover (*T. incarnatum*)	3·30
Buckwheat	9·84	Yellow clover	3·26
Guinea corn	9·27	Lucerne	3·14
Wheat	9·01	Cow grass (*T. medium*)	2·75
Common Scotch bean straw	8·25	Red clover	2·59
Barley	7·74	Chevalier barley straw	1·90
Hay (new)	6·16	Early Angus oat straw	1·50
Winter bean straw	5·71	Red wheat straw	1·50
Hay (old)	4·00	White wheat straw	1·37
Cotton seed cake	25·19	Turnips	1·27
Beans (65 lbs. per bushel)	24·70		

Proportion of Oil contained in 100 Parts of Various Substances.*

Linseed	34·00	Lentils (Scotch grown)	1·79
Sunflower seed	29·98	Maple peas	1·72
Linseed cake	12·79	Winter tares (foreign)	1·50
Rape cake	11·10	Beans (65 lbs. per bushel)	1·59
Crambolina cake	9·50	Field beans	1·58
Cotton seed cake	9·08	Foreign beans	1·51
Oats	6·12	Foreign lentils	1·51
Poppy cake	5·75	Hopetoun tares	1·49

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* Where the substance, as compared with the above list, is not mentioned, it either contains no oil, or so little that it cannot be accurately determined.

PROPORTION OF OIL CONTAINED IN 100 PARTS OF VARIOUS SUBSTANCES—*Continued.*

Guinea corn	3·46	Common Scotch tares	1·30
Grey peas	3·30	Spring tares (foreign)	1·26
Buckwheat	2·69	Kidney beans	1·22
Barley	8·18	Turnips	0·20
Wheat	1·99		

We have already alluded to the fact that Liebig originally enunciated the doctrine that the nutritive value of a food was dependent upon its proportion of the nitrogenized compounds. This opinion, held at one time by nearly all chemists, is materially modified now; and the majority of authorities on the subject agree that a combination of the two classes of substances—the nitrogenous and non-nitrogenized compounds—are essential to promote the "healthy performance of the functions of life." On this point Dr. Voelcker has the following:—"I am very much inclined to believe that the oil is by far the most valuable constituent of all oil-cakes. I am aware that it was the fashion not many years ago to measure the feeding properties, and even the fattening qualities of articles of food, by the amount of nitrogenous or flesh-forming matters; but these views are not supported by any practical experiments, nor, indeed, by the every day experience that we have respecting not only human but cattle food. We pay more for food rich in starch, mucilage, and matters capable of producing fat, than we pay for food which, like bean-meal, is extremely rich in nitrogenous matter, but which does not produce so much butcher's meat. It is a matter of much importance to the farmer to know how much he gets back for the money he expends in the purchase of food. I have no hesitation in saying that more money is made by the purchase of food rich in oil, starch, or sugar, than in the purchase of food which contains an excess of nitrogenous matters."

For a considerable period the "food question" was attempted to be solved by chemical considerations alone; but, of late, those of physiology have begun to have attention paid to them. While chemists have insisted on the importance of the substances of food, the physiologists have insisted, with equal force, upon the importance of the "alimentary process;" so that while chemists have considered more as to what the "foods are in themselves," physiologists pay attention to the "relation they bear to the organism which they nourish." So important a bearing has the whole discussion on the progress of one of the most important departments of practical agriculture, and so frequently has it been discussed of late in agricultural circles, that it would be wrong to omit giving an outline of the matter as it now stands. And this we may be permitted to give in an extract from an article which we contributed to the pages of the *Mark Lane Express*, and which had for its object an exposition of the opinions of Mr. G. H. Lewes, perhaps the most lucid advocate of the views of the physiologists:—

"Mr. Lewes, be it at the outset observed, is not at variance with chemists at all points, nor is he backward in acknowledging the claims which they have ably labored for, to be considered as assistants to physiologists. He fully admits that the physiologists cannot advance without the chemist's assistance; but chemistry he looks upon as a means of *exploration*, not of *deduction*. 'The chemist,' he says, 'may analyze fat for him; but he (the physiologist) will request the chemist not to trouble him with hypotheses respecting the part played by fat in the organism. For, although the chemist may accurately estimate the heat evolved in the oxidation of so much fat, the physiologist has to do with a vital laboratory, extremely unlike that in which the chemist works, and he has to ascertain how the fat comports itself *there*.' The nutritive quality of a food is not alone regulated by the amount of organic or inorganic substances which it contains, but by the relation which these bear to the special organism which they are destined to nourish. We say the special organism; for here comes in the proverb, 'One man's meat is another man's poison,' to remind us of the difference of constitution or temperament existing between different animals; and not only different animals, but between different members of the same class. Thus, referring to individuals of our own species, we all know how, while one kind of food pleasantly agrees with one individual, with another it just as painfully disagrees: with the one it is a nutritious food; with the other in a measure it acts as a poison, disarranging for a time the whole animal economy. How suggestive on this head is the Scottish proverb, 'He pits his meat intill an ill skin!' The same meat which fattens his neighbor keeps *him* lean. Nor will those of our readers who have been and are accustomed to the fattening of animals, fail to remember numerous instances where the same food has had different effects upon different animals; and yet, according to strict chemical analysis, the food contained substances to which a nutritive value was assigned, and which value, if the chemical theory is correct, ought to have had the same effect in all cases. For very interesting examples of the different effects of the same food in different animals, the reader may refer to pp. 59 to 63 of the 'Physiology of Common Life.' . . . .

"'We have little or no guidance from our estimates of the properties of substances out of the body, because the body itself is an important factor in the sum, acting on the substances, as well as being acted on by them; annulling or exalting their ordinary properties in a way quite peculiar to itself.' It may be well here to point out what Dr. Voelcker says on this point, not only as corroboratives of what has been already stated, but also as indicative of the growing opinion—even among some of the upholders of Liebig's classification of food—that the food question is to be decided not merely from chemical data, but from physological reasoning. 'The *total* nutritive effect which an article of food is capable of producing thus depends, first, on the presence of all those substances (nitrogenous and non-nitrogenous); and secondly, on a variety of circumstances to which I beg now to direct the attention of the reader. In estimating the practical value of an article of food we must take into consideration—1st, The age of the animals. 2nd, The various kinds of food. 3rd, The natural disposition or temper of the animals. 4th, The purposes for which the animals are kept.' On all these points the Professor enlarges; space, however, precludes us from giving his remarks in full; a slight glance at their nature is, therefore, all that is permitted us. On the first point, young animals require a more concentrated and easily digestible food than old, with a view to supply muscle and maintain their rapid growth; the conclusion being that food highly nutritious for old will be totally unfitted for young stock. On the second point (see above), he states that it is well known that what is suited for one animal, as a horse, is not so for another, as a cow; the nutritive value of food varying with the description of the animals to which it is given. The natural (third point) disposition of the animals influences the nutritive value of the food; one breed of cattle, for instance, as the Herefordshire or Shorthorns, fattening better than another breed, as Wesh or Kerry cows. The effect, also (fourth point), of the food is influenced by the work which the animal does, or the purposes for which it is kept. After fully dilating upon these points, Dr. Voelcker has the following physiologically suggestive remarks: 'These few examples show that the opinion which is generally entertained of food cannot be invariably the same, but is regulated, amongst other circumstances, by the purposes for which the animals are kept on the farm. The fitness of the same kind of food thus varies with the age, natural disposition, and kind of the animals to which it is given, as well as with the purposes for which they are kept on the farm; and it is, therefore, quite impossible to classify the various articles of food in an order which will indicate their relative feeding values in all cases. But' —and here the reader's attention is particularly directed to the physiological value of Dr. Voelcker's remarks—'supposing the *composition of food to be known*, and the wants of the animals are well considered, it is still *impossible* in all cases to *estimate beforehand* what practical effect a feeding substance *will* produce; for *it may be rich* in flesh-forming substances, and contain fat and heat-producing compounds, as well as saline and earthy matters, and yet it may be, comparatively speaking, but poor food, *inasmuch as its constituents are not assimilated by the animal organism.* The digestibility of food consequently is a point which ought to be kept well in view in estimating its nutritive value. Our knowledge of this process of digestion, unfortunately, is so limited, that we cannot speak definitely of all the conditions which regulate the digestibility of food.

Still, however, a few circumstances may be pointed out, by way of example, which influence the assimilation of food by the animal system.' And here follows an enumeration of these, as—1. Of the kinds of animals. 2. On the amount and character of the woody fibre contained in food. 3. On the amount of flesh-forming substances. 4. On the bulk of food. 5. On the form in which the food is presented to the animal. 6. *On small proportions of substances with which we may not be even acquainted.* Still further, the nutritive value of food is influenced by (1) the prejudicial substances which food may contain; (2) by the mechanical effect the food exercises; (3) by the physical condition of the food; and (4) by the flavor which it imparts to the meat or milk. All these points Dr. Voelcker fully illustrates; but his remarks, valuable as they are, space precludes our giving. The rerder will find them in *in extenso* in the 4th volume, new series, of the 'Journal of the Bath and West of England Society.'

"In the above extracts we have marked certain passages in *italics*, to indicate the very important bearing which physiology *must* have upon the food question. For here chemistry owns itself in fault, and tells us plainly that analyses will not alone show the real practical value of the foods we use. And we find one of the ablest exponents of Liebig's theory pointing out to us a startlingly wide variety of circumstances influencing the value of food, other than the constituents which chemistry unfolds to us. . . . .

"While chemistry and physiology are at one as to the fact that the animal economy requires 'food which is both tissue-making and heat-making to repair the fabric and sustain the temperature,' they are remarkably at variance as to the offices which the various constituents of food fulfill. Thus, while the chemist, as we have already shown, following Liebig's teaching, maintains that the nitrogenous substances *alone* furnish the animal with the materials required to form blood and flesh, and that the non-nitrogenous *alone* maintains the heat and respiration, but cannot make the 'slightest particle of flesh,' the physiologist maintains that nitrogenous constituents are *not* the only tissue-making, or, to use Liebig's term, plastic materials of food, but that they are heat-making as well; moreover, that non-nitrogenous substances of food are not mere heat-making, but that they are tissue-making as well. 'The division of food,' says Mr. Lewes, 'into nitrogenous and non-nitrogenous is a chemical division to which no objection need be made, for it expresses a chemical fact. But when the fact that albuminous substances form a necessary proportion of organized tissues, is made the ground for specially distinguishing them as plastic, and when the presence of nitrogen in these substances is made the ground for specially distinguishing nitrogen as *the* plastic element, the percentage of which is to afford the standard of nutritive value, we see a striking example of chemical reasoning applied to physiology, which a confrontation with nature suffices to upset. For observe: while it is true that "albumen is the foundation, the starting-point, of the whole series of peculiar tissues which are the seat of vital actions" (Liebig), while it is true that the peculiar characteristics of organized tissues, is that they contain albuminous substances as necessary ingredients—not less is it true that the *other* substances thus arbitrarily excluded from the rank of tissue-makers (namely, the fats, oils, and salts, all destitute of nitrogen), are as *essential* as albumen itself. *Not a cell, not a fibre, can be formed, nor can subsist, without a certain amount of fat and salts.* Not a tissue can come into being, or continue its functions, without a large proportion of non-nitrogenous materials, a proportion greatly *exceeding* that of the nitrogenous." Anatomical evidence apparently is clear upon the point that no animal tissue exists composed of albumen, or other nitrogenous substances, *without* the admixture of fats, water, and salts; and physiological evidence is equally clear upon that point that 'albumen undergoes chemical changes, accompanied by the disengagement of heat.' Therefore, says Mr. Lewes, the classification of Liebig 'must be rejected.' Liebig is not unaware of these anatomical and physiological objections to his theories, but he considers all substances which he finds in muscle, over and above the albumen in it, as 'mere accessories.' But what Mr. Lewes states seems very reasonable, if not very convincing. 'But to the anatomist *all* the substances are essential, because it is by their *united* properties that the muscle performs its peculiar offices. A muscle deprived of its water will no longer act as a muscle; the anatomist, therefore, regards water as *essential* to the muscle—the chemist regards it as accessory. In the laboratory, the water may be disregarded; it will not interfere with chemical reactions. In the organism, the water is just as essential to the functional activity of the muscle as the albumen itself.'

"Mr. Lewes goes also pretty fully into an investigation of Liebig's statement, that the non-nitrogenous matters are not useful as furnishing plastic material, but that 'they only serve to keep up the temperature of the body, being rapidly burnt in the body.' We cannot go fully into the matter, but have room only for the following suggestive statements, which Mr. Lewes gives in support of his argument that the non-nitrogenous matters of food *are* plastic or tissue-making. 'That fruits are eaten in southern climates which are less heat-producing, because they contain much less carbon than the train-oil eaten in polar regions, would be a tolerable argument, if only fruits were eaten in the South; but the Sicilian and the Neapolitan eat more oil than the Swede, and their macaroni is a highly carbonized substance; and the Hindoo often subsists on rice and butter—substances highly carbonized, and classed as chiefly respiratory, furnishing in superabundance that very heat which his climate renders so very undesirable. According to *theory*, the Hindoo should eat very little non-nitrogenous food, and be content with plastic substances, since he wastes his tissues in daily labor, but does not stand in need of any surplus heat; whereas according to *fact*, he eats very little nitrogenous food, and a great deal of "heat-making" food.'

"Chemistry has hitherto assigned a very unimportant part to the *inorganic substances of food*. We have seen that, with the exception of the part played by the phosphates of lime and magnesia, which act as the furnishers of 'bone materials,' and the saline substances which supply the blood and animal juices with the necessary mineral ingredients, no other office is assigned to them; and *water* is entirely ignored. Physiology, however, claims to pay attention to *all* the constituents of food, and expounds as a principle, that 'that is an aliment which nourishes; whatever we find in the organism as a constant and integral element, either forming part of its structure or one of the conditions of vital processes, that, and that only, deserves the name of aliment.'"

Chemists have been accustomed to value the roots which form part of the food of our farm stock, nutritively according to the *quantity of water* which they contain—those having the most being the least valuable. In this way, the following are valued in the order of their rotation: Potatoes (highest), Parsnips (second), Carrots (third), Mangolds (fourth), Swedes (fifth), and Turnips (lowest). Liebig, in his classification of the substances of food, ignores the value of water altogether. Physiologists do not thus dismiss water as an unimportant element of food. Forming two-thirds of the living body, and being in point of fact the "most sustaining of all articles," they maintain that if "the purpose of food be to sustain the organism, that article which sustains it longest and can with the least immunity be withheld, must be the most nutritive of all."

Again, we have seen that some chemists, as a body, maintain the identity between animal and vegetable substances, or, at all events, that there is little or no difference between them. The physiologist sees between them a "profound difference; he sees the lion perishing miserably of inanition in presence of abundant herbage, which, to the elephant or buffalo, furnishes all that is required. The ox eats the grass, and the tiger eats the ox, but will not touch grass. The flesh of the ox may contain little that is not wholly derived from the grass, and the chemist analyzing the flesh of both may point out their identity; but the physiological question is not, What are the chemical constituents of nutritive substances? it is, What are the substances which will nourish the organism? If one animal will not eat, or having eaten, cannot assimilate a certain substance, that substance is no food for that animal, be its chemical composition what it may." The following, from the pen of a practical farmer, as given in the pages of the *Mark Lane Express*, will also be of utility as bearing upon this point:

"We must," says this author, "correct a very erroneous doctrine taught by our chemists, that the 'nitrogenous elements' or 'protein elements' of feeding stuffs are the flesh-forming materials, as if flesh was wholly formed of such elements. Now, one plain truth of the matter is soon told, for, as yet, chemistry cannot tell us what the proximate principles are of which beef, mutton, pork, game, &c., &c., are composed. As yet, we do not know chemically those principles that distinguish one kind of meat from another, or one kind of feeding material from another kind. We know beef from mutton by the taste—the flesh of goose from that of caperculzie—veal from venison. Our cattle also know, by the first two catalytic processes in the chemistry of food (smell and taste), the plants they respectively require for food; and this, we repeat, is more than our agricultural chemists have, as yet, told the English farmer. Chemical research has, however, made sufficient progress to warrant the conclusion that the so-called "flesh-forming theory' is a very fallacious one, and very reprehensible, owing to the immense amount of harm which it has done in practice. In other words, the so-called flesh-forming materials only form a very small fractional per-centage of flesh. Thus, Berzelius, long ago, gave the following as his analysis of the lean of beef:

Muscular fibre, vessels and nerves	15·8	17·70
Cellular tissue, convertible into gelatine	1·9	
Soluble albumen and coloring matter		2·20
Phosphate of lime, and albumen		0·08
Alcoholic extracts, with salts (osmazome)		1·80
Aqueous extracts, with salts		1·05
Water		77·17
		100·00

"More recently, Liebig found in the juice of flesh, kreatine, kreatinine, lactic acid, mosinic acid, phosphoric acid, phosphate of potash, chloride of potassium; while there remained other substances not yet ascertained.

Now, such being some of the proximate principles present in flesh—present, too, in greater abundance when animals are fed on the natural system than when they are fed on the obese system—the manifest conclusion to be deduced is this: that our artificial *obese* systems and flesh-forming theories are both subject to improvement; and that, for the necessary information to guide us in this work of improvement, instead of going to the laboratory of the chemist, and the crack farm of the amateur obese experimentalist, we ought rather to go to the practical school of nature."

Such may be taken as our unprejudiced *resume* of the opinions of the chemists and physiologists of the present time on the food question. Whatever may be the value of the positions advanced by physiologists in controverting those of the chemists, there can be little doubt, we apprehend, in the mind of those who have at all studied the habits and peculiarities of our farm-stock, that the various phenomena connected with their feeding and fattening are not to be accounted for by the dicta of chemistry alone. Physiology must also be brought to aid us in discovering how best and quickest to bring up our animals.

But there is still another consideration which has lately begun to attract the attention of chemists themselves, as to the value of food analyses. These considerations we have briefly enforced in an article contributed to the *Mark Lane Express*, which we here venture to reproduce:

"Of late years, chemistry has done much to place before us analyses of our various crops, from which we are enabled to judge not only of their relative but their actual feeding value. But, notwithstanding all the care which has been bestowed upon this branch of agricultural economics, it may be considered almost certain that this same diversity in the condition of crops—which is certainly found to exist in a very marked manner, not merely between the crops grown in one locality and those grown in another and perhaps distinct one, but even, as I have above stated, in crops grown in the same soil—does very materially modify the value of these chemical analyses, and, in the same proportion, the feeding effects which may be predicated to follow from their use, taking these analyses, as the basis of our belief in our conjectures. In making this statement, I am not at all desirous to underrate the importance of the services which chemistry has rendered to agriculture. On the contrary, I think highly of these services; and, indeed, the most advanced and trustworthy of all our agricultural chemists—the worthy Dr. Voelcker—has himself, in very pointed language, directed the attention of feeders to the danger and loss likely to arise from supposing that the chemical value of a food defines its practical value. He says: 'We are too much in the habit of speaking of cake, turnip, mangold, or hay, as if these complex mixtures of substances were simple chemical combinations; whereas, the differences in two samples of the same produce are often very great. Any one who has tried practically the nutritive effect of good and badly-made hay, or of turnips grown on good land and on peaty land, knows well that there is a vast difference between hay and hay, or a turnip and a turnip.' Such considerations open up points of the highest possible importance to those connected with farming. It is impossible to overrate this importance. We have yet much to learn in regard to the modifying circumstances of different modes of cultivating crops, on their nutritive value, the influence of soil, manure, and the modes of their treatment and application, peculiarities of the weather, the absence or presence of rain, &c., &c. On all these points connected with crop culture we shall doubtless grow wiser as we grow older in agricultural experience; this only, however, where, with advancing years, we determine to acquire advancing wisdom, and if our practice, moreover, will not distain to co-operate with theory in bringing the matter to a successful issue.

"Such considerations as in this note I have briefly and crudely presented, while they point out the danger of implicitly following any analysis of a food, as indicative of its feeding value in practice, by no means prove that these analyses are useless. They do—and in doing this they are of high value—show, whatever else they do not show, the *relative* vale of feeding substances, from which comparative data are obtained as to the value of one grain compared with another grain, or one root with another root. For it is to be presumed that, although one mangold may vary from another mangold in value, yet all mangolds will possess the same characteristics of composition which distinguish them from other green crops, as cabbages, turnips, or rape, or from the grains. Each crop possesses its own distinctive feeding, as it possesses its own cultural characteristics. These comparative data are essentially of high value; for by their means we can ascertain how far likely one root is to serve our purposes, as compared with another root, or one grain with another grain. It is difficult to say whether the fact is to be regretted or not, that the peculiarities of culture prevent analysis from going to the extent of indicating that the value of a grain or a root crop, once obtained, will always be its value."

But our historical outlines of farming economy, in the department now under consideration, would be very incomplete did we ignore the importance, or overlook the notice, of the question connected with the use of *concentrated or condimental cattle foods*, now attracting so much attention amongst practical and scientific agriculturists. The whole matter at stake in the discussion is of such vital importance to the agricultural community, that we deem it right to devote some space to show how the question at present stands.

When first introduced, these foods were liberally advertised as containing a large amount of nutritive matter in a very small bulk, that is, in a highly *concentrated* form. Hence they were called concentrated foods. In so calling and so considering them—or, at all events, in being desirous to have the farmers who were to use them as cattle food so to consider them—the advertisers and makers of these foods were evidently led away by the idea that just as the researches of science had enabled concentrated manures to be used for the support of plants, so, in like manner, could concentrated foods be used for that of animal life. But the very important distinction between plants and animals was overlooked. Dr. Anderson, in an able paper on the "Composition of the different kinds of Concentrated Cattle Foods," in the "Highland Society's Transactions," (1862), shows the profound difference between plants and animals, and that their functions are diametrically opposed. While plants imbibe their food in the form of simple compounds, building up therewith the complex constituents of their tissues; animals possess, on the contrary, no such powers, but require their food in bulky and complex compounds. In performing the functions of life these compounds are destroyed, returning to their original simple forms; so that a plant may be looked upon as "a piece of mechanism adapted to the construction, and an animal to the destruction, of organic compounds." A manure, therefore, may be concentrated, because from it may be extracted the simple compounds required for the food of plants; but a food cannot be so concentrated, inasmuch as the animal economy requires that the food compounds shall be at once complex and bulky, as in the forms "of sugar, albuminous compounds, and the like."

Mr. Lawes also very forcibly, and we think decisively, puts this matter at rest. In using a concentrated *manure*, which contains "a certain amount of nitrogen and phosphates, the bulk of the crop is obtained from *other sources*—such as the *atmosphere and water*, not supplied by the farmer's hand, *the natural constituents existing in his soil, and the residue from various manures and crops* . . . . No concentration of constituents, nor any amount of supply of some only of those required for the *respiration*, the *perspiration*, the *excrements*, and the *increase*, can enable the animal to obtain a particle of what is requisite for those from *any other source than his food*." Moreover, a certain amount of bulk is required in the food, especially for our ruminating animals; without this physical quality the animal economy suffers.

The notion, then, of being able to give a food in a concentrated form was apparently given up, and the use of the term "condimental" substituted. And without prejudice it may here be stated that the weak point of the makers of these foods was thus abandoned, and a much stronger position assumed. This opinion, however, we shall see as we proceed, is not universally held.

These condimental foods, as they are now termed, are, for the most part, mixtures of "several different substances, of which fenugrec, &c., form part." Dr. Anderson analysed several of these compounds, the most important of which we here give. It was difficult in making these analyses to obtain and examine the essential oil which formed a part of these compounds, as it was so small in amount, and the odorous principles which came ever along with it in the process of distillation so marked its peculiar smell, that it could not be recognized. Enough is given in these analyses, however, to enable an opinion to be formed as to the substances of which these "foods" are compounded.

THORLEY'S CATTLE FOOD.

Organic Constituents.		Inorganic, or Ash.	
Water	11.41	Sand	0.33
Oil	4.06	Phosphates	0.51
Albuminous compounds	11.47	Phosphoric acid in combination with alkalies	0.53
Sugar	17.15		
Starch	46.90		
Woody fibre	6.22		
Ash	2.83		

The aromatic seems to be fenugree, but accompanied with a bitter substance, probably gentian.

HENRI'S PATENT CATTLE FOOD.

Organic Constituents.		Inorganic, or Ash.	
Water	11.26	Sand	1.72
Oil	6.22	Phosphates	1.23
Albuminous compounds	12.87	Phosphoric acid in combination with the alkalies	0.64
Sugar	9.05		
Starch, etc	46.57		
Woody fibre	9.66		
Ash	4.37		

This food contains some oily seed, and its taste is more bitter than Thorley's, and its color yellow.

These foods are not recommended by the makers to be used alone, but in conjunction with the ordinary food of the stock. Dr. Anderson has shown that their only peculiarity is the aromatic or bitter matters which they contain.

For long these foods, although apparently largely used by practical farmers, were not taken cognizance of by our agricultural societies. The subject was, however, brought before one of the weekly meetings (1862) of the Royal Agricultural Society of England, and a prominence was given to its discussion which had never before been accorded it. This meeting had the useful effect of bringing before the agricultural world the arguments, *pro* and *con*, of practical farmers and men of science. And of these it may be said, as a rule, that those who are in favor of condimental foods belong to the body of practical farmers; those who do not favor them belong to the body of scientific men.

The discussion at this meeting was opened by Mr. Beale Brown, a well-known agriculturist, who stated that at one time he was prejudiced against the use of these condimental foods; but he had found, from his own experience, that they possessed excellent fattening and tonic properties. His opinion, he also stated, could be backed up by a "pile of letters" from practical men who had used them with the like results. Mr. J. B. Lawes, the well-known chemist, and Professor Simmonds, of the Royal Veterinary College, took part in the discussion. "A larger quantity of food," says Mr. Lawes, "is required to give the same increase of flesh." When Thorley's food is added, and this is the result which science would predict, there is nothing in science to predicate that an article which has great tonic and stimulating properties is likely to increase the assimilation of food. You may make a large quantity of food pass through the stomach of an animal, but you cannot make him assimilate these foods. If, therefore, you regard these things as food for animals which are in good health, they are not to be recommended at all. Call them medicines, if you like. have no doubt they have considerable medicinal properties, and do enable animals to digest their food where otherwise they would not do so." Professor Simmonds is clearly of opinion that, "even as medicinal agents, they are very bad indeed as medicinal compounds," although he admits that many of them may have the effect of "invigorating the system, and if the powers of digestion of the animal were weak, of enabling it to digest a given amount of food in a less space of time, and consequently to appropriate, by assimilation, a larger portion of food than otherwise would be assimilated." All these effects, the Professor believes, would be obtained much cheaper and simpler by the farmers making for themselves a condimental food, such as "well-ground linseed meal, mixed with bean meal, salt, cumin seed, caraway seed, ginger, gentian, or any of those materials which would act simply as stomachics."

It appears to us that in the discussion of this most important question, too much stress is laid by the opponents of these condimental foods upon the high price at which they are sold. Now, in treating the matter calmly and philosophically—as it should be treated—this, although part of the question, is not the whole of it, nor, indeed, by any means, the most important part of it. The great point we take it is, "is there any feeding value in these foods?" Let this be decided in the negative or affirmative, as the case may be, and decided in such a way that the farmers of the kingdom will accept the decision as authoritative and trustworthy. If in the negative, there is no use in further discussing the matter; but if in the affirmative, *then* is the time to discuss what this *value is worth*. If it is proved that the manufacturers of these foods ask more for them than they are really worth, then means may be taken to get them at a cheaper rate. But we contend—and this in no way as the advocates of cattle food, but solely in the interests of the body so closely connected with practical farming—that the true way is, not to discuss the price as the important point *first* to be attended to. If we want to buy a yard of cloth, or a farm, we first test their value, then discuss the price. If we want neither, the price, be it low or be it high, need not, and does not in reality, trouble us. Further, the physiological points connected with the question have been too much ignored or overlooked in the discussion of the question. The likes and dislikes of our animals must, and do, exercise an important influence on the food which they partake of; and we know that condimental and medicinal properties are present, as pointed out by an able writer, in the richest and most esteemed of our cattle food, namely, the "natural herbage of the fields. In the common language of practical farmers, the medicinal properties of the grasses and other plants eaten by cattle are their odorous and sapid properties. All attempts hitherto made to classify them under such heads as bitter, saccharine, saline, astringent, acid, aromatic, fetid, acrid, alliaceous, musky, etc., etc., have failed. When several of them are combined, or present together in one plant, as they generally are, such as saccharine, saline, bitter, acid, and aromatic, it is not very easy distinguishing the one from the other, or saying which may be predominant, or how many may be present in one plant. But with the peculiar taste and smell of each plant farmers are familiar, and also with the fact that the quantity and quality of these odorous and sapid properties *are very different under different seasons, and under different modes of management and circumstances connected with the harvesting* and using of them. They are also familiar with the fact, that the value of these plants as feeding materials are dependent upon the fineness of the quality and the largeness of the quantity of the odorous and sapid properties, or natural condiment, which such feeding materials contain when given to cattle."

Still further, we have yet much to learn in connection with the physiological effect of the *mixtures* of different kinds of food, and of the state, form, or condition in which they are given. We have also much to learn as to the process of digestion,—so much, that a correct definition of the term, or rather a statement of the process which the term includes, is not yet decided on. We incline to the belief that much good will ultimately result from the discussion of this condimental food question, and that it will be the means of urging men of science, aided by those of practice, to endeavor to ascertain the reason of certain phenomena which are now puzzling in the extreme. We have of late been examining these phenomena, and pushing forward inquiries into this most interesting field of investigation. The result of the observations we have made we purpose giving in an extended paper on the whole subject of cattle-feeding, in another medium.

THE REARING AND FATTENING OF STOCK.

BY PROF. VOËLCKER.

Prof. Voëlcker delivered a lecture to the members of the Maidstone Farmers' Club, "On the principles of nutrition, as applied to the rearing and fattening of stock." The lecture was as free from technicalities as it was possible to render such a subject, and was perfectly clear and intelligible to all. The figures referred to were shown on diagrams, and were all the results of actual experiments.

Prof. Voëlcker, in commencing his lecture, remarked that the present low price of corn of every description, the failure of the turnip crop, and the high price of meat, were no doubt inducements with the committee of that Club to select the subject of the rearing and fattening of stock. He was glad that the committee had defined the subject of the lecture so well. It had struck him that one great objection to public lectures at the present day was that scientific men had been trained in a different school to that in which the practical farmer had been taught. To instruct practical men upon a subject in which they were very much in advance of scientific men he could not hope to do. It was decidedly not the object of scientific men to endeavor to teach those who all their lifetime had been occupied in a certain business, but to carefully investigate facts, to sift them, and reduce them to principles, so as to become a general store of useful information to all those who might come after them. It was, then, upon the principle of rearing, and more especially upon the principle of fattening stock, that he was happy to give them some information that evening. Now it was evident that if they wanted to make the most of the food they gave to their stock they must know something of the constituents of that food, and also of the material substances of which the bodies of animals were composed. Without taking notice of minor forms of matter, the substances of the body of an animal, as they saw it before them, mainly consisted of the flesh (or lean), the fat, and the bony structure. He did not mention water, as two-thirds of all living animals consisted of that element; but they had principally to do with the solid substances. Now the lean part of an animal consisted of what was termed nitrogenous matter; while the fat was distinguished by a total absence of nitrogen, but contained a very high per centage of carbon, or heat-giving matter; and the bony structure was chiefly composed of mineral substance. In store beasts the nitrogenous substances, in 100 parts, amounted to 18 per cent., the fat to 16, and the mineral matter to only 5 per cent., making a total of dry substance, in round numbers, of 39 parts, the remaining 61 being water. In the fat animals nitrogenous matter receded, while the fatty substances increased, in the case of oxen, to 30 per cent., the proportion of mineral matter, and also of water, somewhat decreasing. The same results were found in sheep, only that the fatty matter increased to a larger extent; while in pigs the increase was even more marked, showing the remarkable adaptation of pigs for fattening. The mode in which fat was deposited was also very different in the several kinds of animals; whereas in pigs the deposit was principally on the outside, in sheep there was more inside fat, while in oxen the fat became more intimately incorporated with the lean. They might therefore call the fattening of animals that process which converted lean meat into fat, with the subtraction of water, or rather the replacing of water by fat. In fact, in fat pigs there was only 43 per cent. of water, whereas in store pigs there was as much as 61 per cent. Now if they intended to make the best use of food which they gave to their animals, it was absolutely necessary that they should look a little more closely to the manner in which these primary substances were constructed, or built up, together—in other words, they must look to the organization of the animal itself; and here, again, they found a very remarkable difference in the several kinds of stock. Some years ago very careful experiments were made by Mr. Lawes, of Rothampsted, Hertfordshire, who showed the relative proportions of what were called the offal parts to the saleable meat, taking an average of 16 oxen, 249 sheep, and 59 pigs. In oxen they found that out of 1000 lbs. live weight the stomach and its contents amounted to 11½ lbs., while the intestines and their contents weighed 2¾ lbs.; in sheep, the proportion of the stomach and contents was only 7½ lbs., while of the intestines it was 3½ lbs.; and still more striking was the difference in pigs, the stomach and contents comprising 1¾ lbs., and the intestines 6¼ lbs. From this, therefore, they saw that though the stomach of the pig was very small, the intestinal canal, which elaborated the food, was very much longer in proportion to the other animals; and these facts at once indicated the food that must be given to these three different classes of animals. They knew by experience that pigs required a more concentrated and more digestible food than sheep; and again oxen required a much more bulky food than sheep. In this way they filled up the stomachs of animals and made the best use of food which, like straw and hay, was comparatively speaking of little use to sheep, and of no use whatever to pigs. It was doubtful whether the woody matter of straw—or, to give it its scientific name, the cellular tissue—was at all digestible by the last-mentioned animals. Taking the total offal parts together, they amounted in oxen to 38.9 parts, in sheep to 40.3, and in pigs to 16.7. With regard to the relative proportions of these parts in store or fat stock, they found that in store sheep the total offal amounted to 45.2, in fat sheep to 40.6, and in very fat sheep to only 35.5; so that by fattening they reduced the offal parts very considerably, and produced a greater amount of saleable meat. In the next place he would direct their attention to the composition of food. They found in this the very same chief constituents as in the animal body—nitrogenous substances, capable of supplying the muscle or lean part; non-nitrogenous matters, which produced fat, and kept up the animal heat and fed the respiration; and mineral or inorganic substances, which went to form the bone. No food which did not contain an appropriate portion of these three different classes of materials was fit by itself to maintain the health and rapid growth of an animal. Now, it of course depended on the purpose for which they wished to keep an animal, and also on its age and condition, as to in what proportion it should be fed with these different constituents. Beanmeal contained as much as 23 or 24 per cent. of flesh-forming matter; and it was a remarkable thing that this matter was associated, in every description of food, with bone-producing material. Hence they would see the propriety of giving such food to young animals just weaned. Lentils, beans, and peas, for all practical purposes, might be said to be identical in composition, and to answer the same purpose. But these formed a description of food evidently not well adapted for the production of fat. In barley meal, as compared with beans or peas, the flesh-producing constituents amounted scarcely to one-half—in other words, to only 10 or 11 per cent., as against 23 or 24; but it was very much richer in fat-producing substances, and this, of course, would explain why it was such an excellent food for fattening pigs. With all the progress of science, and all the experiments that had been made, he would defy any one to find a better food for this purpose. On the other hand, if they kept animals for doing actual labor on the farm, they must not give them food which contained too much fattening substance, but food which went to supply the muscle, which in hard work suffered greater waste than any other portion of the body. Hence for working oxen beans and peas were particularly well adapted. Let them in the next place trace the passage of the food through the body. They had seen that food was given—first, for maintaining the body in its present condition; secondly, to counteract the daily waste; and thirdly, to cause an increase in size. A very considerable portion of the food of animals was wasted in respiration; and one great purpose of the food was to keep up a uniform temperature of the body, or, as it was termed, the animal heat. Now, of course, it was a matter of considerable practical importance to ascertain how much food was required to meet the daily waste of an animal, and to feed the respiration, for unless they understood these wants of the body they might go on giving animals food forever without getting them fat. It was really not so much a question of greater or less expenditure which determined whether a feeder or fattener of stock was a successful man, as it was a question in what space of time he was enabled to do this. In this respect wonderful progress had been made during the last fifty years. Oxen and sheep, in passing from the store to the fat condition, increased about half in weight; but pigs nearly doubled their weight. According to the then prevailing practice, it took the late Duke of Bedford, in 1795, sixty-five weeks to obtain that increase in sheep; while at the present time some twenty-five or twenty-six weeks was about the average period. With that improvement, however, he (Professor Voëlcker) was scarcely satisfied; for he believed that with a proper selection of food it could be done in about twenty weeks, or even in less time than that. It has been found from experiments that to produce 100 lbs. increase of meat an ox would require to be supplied with 250 lbs. of oil-cake, 600 lbs. of clover hay, and 3,500 lbs., or a ton and a half, of swedes of good quality. In this total quantity of food they had in reality only 1,109 lbs. of dry substance, namely, 218 lbs. of nitrogenous, 808 lbs. of non-nitrogenous, and 83 lbs. of mineral matter; the rest being water. In 100 lbs. increase the dry substance consisted of 9 lbs. of flesh, 58 lbs. of fat, and 1.6 of mineral matter. Fully three-fourths of all the nitrogen in food went into the manure. Thus, if they gave an animal food which, like oil-cake, contained from 26 to 27 per cent., and even 29 per cent. in the case of rape-cake, of nitrogenous matter, they would get a very much richer manure than if the animal was fed on Indian corn, or even barley meal or oats. Therefore, although there was a certain waste in giving fattening animals food too rich in flesh-forming materials, this was to some extent compensated in the increased value of the manure. But they would observe that out of these 1,109 lbs. of dry substance in food no less than 636 lbs. were required to feed the respiration; so that it was evident that if they gave an animal too little food, it could do nothing beyond keeping up its own heat, and supplying the waste in respiration, while it would make but little and poor manure. They might go on feeding it for ever so long a time, but would merely maintain it in its present condition; and to that extent the food was wasted. Therefore, in order to make the feeding process pay, they must supply a sufficiency of food that contained a good deal of matter capable of producing fat. In the first place, they had ready-made fat, which, as a rule, might be taken as the most fattening of all food constituents. Hence the quality of an oil-cake was very much measured by the quantity of fat it contained. They knew that a very hard-pressed cake was not so fattening as one from which less oil had been extracted. It might therefore be useful if he mentioned some few kinds of food which contained this ready-made fat. In the first place they had linseed, which contained as much as 34 per cent. of oil or fat; but, as linseed had a commercial value of its own, it was questionable whether they could profitably use linseed, as such, for the fattening of animals. In linseed cake, however, they got the same material, though as a refuse;

and this refuse contained as much as from 11 to 13 per cent. of oil. In some of the foreign kinds of linseed cake the oil was much less considerable than in the better descriptions of English linseed cake; and this was, therefore, one of the reasons why the latter was often preferred. Another description of food which was extremely rich in oil, and which had lately come much into use, was the palm nut kernel. Not only did this possess excellent fattening properties, but he was told that cows fed by it produced a larger amount of milk, and that the milk was also richer in cream than that obtained from any other description of food. While speaking of the palm nut kernel, he could not refrain from mentioning a circumstance connected with the use of it, for he might say it was a child of his own. He tried very hard for some time to induce agriculturists to use this peculiar kind of food; but he was unsuccessful. At the present time, however, it was highly appreciated wherever it had been tried, and the demand for it was greater than the supply. About five years ago, this palm nut kernel was sent to him for analysis by a Liverpool importer. From the kernel was obtained an extremely nice oil; and, on a full examination, he reported favorably of it, as it contained so much as 25 per cent. of the oil. He then resolved to give it a practical test, and, accordingly, tried it upon the farm connected with Cirencester College. The substance was duly given out to the cowman and the shepherd. Like every description of new food, it was not considered palatable by the cows and sheep, for the simple reason that they had been accustomed to the best description of oil-cake. Cowmen and shepherds, too, did not, generally, like to take too much trouble; and so it was reported that this food was of no use. It was therefore consigned to the granary for nearly nine months, during which time the price of oily food rose considerably; and it became at last a complaint that the sheep very nearly eat their heads off [a laugh]. In this extremity, the shepherd and the cowman again tried the palm nut kernels; and, as the sheep had been nearly starved, when the palm nut was given them they ate it readily enough, and throve upon it. After a time, they came to the conclusion that the palm nut kernel was the best feeding substance that could be given to cattle; and, in one season, they had used as much as thirty tons of it; while their sheep had gained the prize at the agricultural show at Gloucester. This was rather an interesting instance of what might be done by perseverance in the first instance in trying a new article. The animals might at first turn their noses up at the food; for, if they accustomed them to one particular kind of food, they would not take any other very readily. But it was well to accustom them to a change. In addition to ready-formed fat, food containing starch, sugar and mucilage was also well calculated to fatten animals, though in a far less degree. The fat-producing quality of food was measured by the amount of carbon it contained; and, inasmuch as they had in fat about 2½ times the quantity of carbon which existed in starch and sugar, it of course would take 2½ times as much of the latter constituents to produce a given amount of fat. Still, sugar and starch were most readily converted into fat. They were very digestible, and therefore specially adapted for animals provided with a long intestinal canal, such as he had shown the pig to possess. Barley meal contained as much as 68 per cent. of this property, and the better descriptions of Indian corn fully as large a quantity. But to show what a large amount of the constituents of the food passed into manure, or was wasted in respiration, he might mention that, to produce an increase of 100 lbs. weight in the sheep, they would require to give the animal 250 lbs. of oil-cake, or its equivalent in other descriptions of food, 300 lbs. of clover hay, and 4,000 lbs. of swedes. This would form a total of 912 lbs. of dry substance; and they would have stored up in the animal 75 lbs. of nitrogenous substance, 63.0 of fat-producing, and only 2.0 of bone-producing matters. 291 lbs. passed out into the manure, and 548.5 was lost in the respiration. Turning to pigs: To produce an increase of 100 lbs., it took 500 lbs. of barley meal, which yielded a total of dry substance of 420 lbs. From this they gained 7.0 lbs. of nitrogenous substance, 66.0 lbs. of fat, and 0.8 of mineral matter in the animal. They would observe that whereas, in the case of oxen, 1,109 lbs. of dry substance were required to produce an increase of 100 lbs. live weight, 912 lbs. were required in sheep, and only 420 lbs. for pigs. In barley meal they had very little woody matter —only some 3 or 4 per cent. In clover hay, however, there was a large quantity of this matter, and which they gave to the ox in bulky food in much larger proportion than to the sheep; while, again, pigs required a more concentrated food than sheep. To deviate a little from his subject, they would see that, after all, there was some amount of good sense in Banting's system [a laugh]. Carried to an extreme, he believed it would be calculated to do harm; but, in moderation, he looked upon it as a most useful protest against the vegetarian system. Man was not a vegetable-eating animal. He had only six ounces of stomach in proportion to 100 lbs. of the body, and therefore required a concentrated food—that was to say, food which contained a great deal of flesh-forming matter. Potatoes would make a man fat; but they could not expect to get much labor out of a man who fed on such diet alone, as there was a great deal of muscular waste to keep up. At the same time a moderate amount of vegetable was, of course, conducive to health. But to return. Before starch was converted into fat, it had to undergo a change into sugar. Now, to produce this change, force must necessarily be expended; and for this reason he conceived that when sugar was supplied to the animal directly it was perhaps better adapted for the rapid production of fat than starch itself. At any rate, he held that a moderate amount of sugar was calculated to render many kinds of food much more palatable and digestible. And it was on this ground that he could speak in favor of giving malt to cattle. He looked on malt somewhat in the same light as he did on condimental food. He was not prepared altogether to disparage such food, but he maintained that the farmer ought to have sufficient intelligence to make his own condiments. With regard to malt, however, he was quite confident it would never be given as an entire substitute for barley meal. It was too expensive, for one thing; and, in addition, the effects of malt, as compared with those of barley meal of good quality, were not such as to induce practical men to use it very largely in preference to the latter. Animals had been fed with an equal quantity of barley meal, and malt made from an equal quantity of barley, but the result was certainly not in favor of malt. Still, malt would perhaps come to be used in considerable quantities in order to make food of an inferior character more palatable and digestible; and, in this direction, he looked forward for useful information; and their aim should be to find out what were the uses of malt in particular cases. If, for instance, they were fattening prize animals for Christmas shows, it was of great consequence that they should give them some constituent which would render the large amount of food supplied to them sufficiently digestible to keep them in a healthy condition; and, to produce this result, food which contained sugar was found to be very conducive. Even an excess of oil-cake was calculated to derange the general well-being of an animal in this fat condition; and, under these circumstances, malt, or other food containing sugar, would be of considerable advantage. In this view, he would also recommend to them food known under the name of carob or locust beans. These were extremely sweet, containing as much as 54 per cent. of sugar. They possessed very little woody fibre, not a large quantity of flesh-forming matter, and but very little mineral substance. They were therefore unfit for feeding too young stock, but exceedingly well adapted for stock in the fatting condition. On this principle they were, no doubt, used in very considerable quantities in "Thorley's food for cattle," and other nice tasting artificial kinds of food, now sold at high prices, but which could be made at a very much cheaper rate, if the ingredients were bought and mixed by the farmer himself. Carob beans might be very usefully applied for mixing with food which had rather a disagreeable taste. For instance, rape-cake had a bitter taste, which did not suit animals well; and it was on account of this taste, more than anything else, that rape-cake was not of such high value as linseed cake. He believed that there was great truth in the remark that animals must to some extent be pampered in their taste, and that food which they did not like did not do them so much good as other kinds to which they took more readily. The pungent taste in rape-cake might, however, be overcome by mixing it with carob beans. But here, again, they met with a practical difficulty; for if they used the beans in their natural condition the animals would pick them out, and leave the cake behind. Under these circumstances he would recommend that they should break up the rape-cake as usual, and then put to it a sufficient quantity of water to make it into a thin soup. By boiling this up for an hour they would get rid of the disagreeable—and as he believed also injurious—oil which the animals did not like. Into this soup also he should recommend them to throw a certain proportion of carob beans, and let it stand for another half hour, during which time the sugar would be dispelled from the beans, and they would thus get a nice tasting mess, with which, in the case of feeding bullocks, some cut-up straw might be given; and in this way he believed a very much larger proportion of straw than was at present used might be turned to profitable account. After then briefly recapitulating the several points of his lecture, the Professor said, if time had permitted, he should have liked to dwell on some of the descriptions of artificial food used in this country, and especially in seasons when the high price of oil-cake tempted unprincipled men to dilute it with inferior substances. At the present time, he was sorry to say, oil-cake was very much mixed with a substance which, although no doubt possessing some feeding properties, had a commercial value very much lower than oil-cake generally. He here alluded to bran; and, although he believed the farmer would find it well that a certain proportion of this should be mixed with his oil-cake, he had very much better buy the genuine articles, and mix them himself. There were other substances besides bran with which oil-cake was largely adulterated; and it would also be interesting to go into the comparative value of cotton-cake, linseed-cake, and some other descriptions of oil-cake. But this would occupy more time than could be bestowed on such subjects then; and therefore it only remained for him to thank them for the kind attention which they had paid to his remarks.

Mr. Kemp said he thought it would be very useful if the Professor were to inform them of the relative value of cotton-cake and linseed-cake, considering the largely-increased extent to which cotton was now cultivated in India and other parts.

Mr. Punnett said, as Professor Voëlcker had remarked, that was a subject which, perhaps, would take too much time to elaborate at that late period of the evening; but as they hoped to see the Professor twice during the season, it might be dwelt upon in a future lecture. He could support most strongly what Professor Voëlcker had said with regard to rape-cake. For years past he had been in the habit of converting the cake into a kind of soup, and mixing it to a large extent with very finely-cut straw. The whole was put into a bin and steamed, by which means a most nutritious and pleasant food was produced. Last year his bullocks fed on nothing else but this and roots, except it might be a little bean-meal "just to clear out their mouths," as it were. In cotton-cake one of the great disadvantages was the husk, which irritated the stomachs and produced inflammation; but by turning it into soup, and steaming it in the manner he had stated, they would entirely get rid of this drawback. By this means also they could largely substitute straw for hay, and be less dependent on root crops.

Mr. Stonham had understood the Professor to say that it was not desirable to give locust beans to young stock. Now the autumn of 1859 was a very growing one, and the turnips did not ripen nicely. His lambs were taken from rape-cake and mangel-wurzel (receiving in addition half a pint of oats and half a pound of trefoil hay per day), and fed on turnips, also with the oats and hay. He soon found that there was something the matter, as the animals were taken with purging and shaking of the head; and he lost six in about as many days. He then shifted them back on to the rape and mangel-wurzel, and suffered no loss. Subsequently, they were again put on the swedes, when six more died; but on substituting about half a pound of locust beans per day for the oats and hay, all went on right with the lambs.

Mr. Elvy, referring to the remarks of Mr. Punnett, said that straw was a great fertilizer, and if they used all their straw in the feeding of bullocks how could they make up the deficiency in their manure? With regard to oil-cake, as a practical grazier, he could state that the more oil they pressed out of the cake the better. He affirmed positively that if they were to press the seed so as to get out say 9 gallons of oil, and then re-press it, so as to obtain 11 gallons, cake made from the latter refuse would be better for fattening animals than that which had been less pressed.

Professor Voëlcker, in replying to the questions suggested, said that cotton cake was a most nutritious kind of food, but it had the disadvantage to which Mr. Punnett had referred, in the harshness of the husks; but if by soaking the cake, and still better by steaming it, they could counteract this evil, they would find it a very cheap and useful kind of cake. With respect to locust beans, what he meant more especially to say was, that these by themselves were not a good kind of food for young stock, but when mixed with other descriptions of food they might be very usefully given. In the case mentioned by Mr. Stonham, perhaps the swedes given to the lambs were not perfectly ripe?

Mr. Stonham: I said that was so.

The Professor said, under these circumstances, he could quite see the propriety of making this change, because the sugar in the locust beans made up for that which was imperfectly formed in the unripe turnips. With respect to oil-cake, they must bear in mind that linseed oil had medicinal properties, and it, of course, would not do to give it in excessive quantities, as was often done; but if they dealt with moderate quantities, he contended that the more oil there was left in the cake the better it would be.

Mr. Punnett, with reference to the remarks of Mr. Elvy, said that gentleman was a large hop grower, and also a large converter of food into beef and mutton, but not a very large producer of straw; consequently, he (Mr. Punnett) could quite understand why he should apprehend a deficiency of straw if the animals were fed upon it. But it was an exceptional case; for many others present did not keep animals in anything like the same proportion to the straw which they produced.

Mr. Freeman said that he could fully bear out the remarks of Mr. Punnett with regard to the utility of feeding beasts with straw. He had now had ten years' experience of this practice; and he thought there were gentlemen present who would testify that he had produced some good animals during that time. He should exhibit some beasts for Mr. Betts this Christmas which had never had a taste of hay till the 1st of May this year. He was convinced, therefore, that the cheapest and most profitable method was to feed their bullocks with straw; though with this he liked to have a fair proportion of roots, as he thought one counteracted the effects of the other.

On the motion of Mr. Hodsoll, a cordial vote of thanks was given to Professor Voëlcker, for his interesting lecture.

THE ERRORS OF MODERN FARMING.

BY MR. WOOD, OF WROTHAM PARK.

At the late meeting of the Croydon Farmers' Club, Mr. Wood, of Wrotham Park, Sevenoaks, said: The subject he was about to bring before them that evening, namely, "On the Errors of Modern Farming," was one that he should not exhaust at that meeting, as he had no doubt there were many that he should not touch upon. Many of them may say, "It is very easy to find fault and tell us of our errors; but can you tell us how to remedy them?" Now, that was the very thing he would endeavor to do. They were all well aware that seasons differed so much, that any positive or fixed system could not be carried out. Still, there were many errors practiced that often might, with little, or perhaps no more cost, be, he believed, carried out to very great advantage. They heard of high farming, and low or dirty farming, but what they wanted to find out was good farming. The question might be asked, "What is good farming?" He should say, it was the practically finding and carrying out the full development of the soil, so that the greatest amount of produce might be obtained with a profit to the grower, on an average of years, for his capital and labor. He could assure them that it was not for the sake of finding fault that he addressed them that evening, as he felt that he must plead guilty to all the errors that he should treat upon in his own practice; but, feeling as he did, that agriculture, or the manufacture of food for the million, is of such vast importance to any country, and particularly so to our own, anything that they, as a farmers' club, could suggest to increase their growth with a fair profit to themselves, must be of great benefit to all classes of the community. First—On the present rage for converting arable land into pasture on account of the low price of corn: There has been much said of late on the necessity and advantage to be derived from laying down land for permanent pastures; and having had lately some experience in laying down many acres, he would treat a little on the subject. It had not, he thought, had sufficient consideration by many who were doing so, as there were many objections, as well as advantages, to a very general and extensive change from arable to pasture, as they were all aware that it took some years, and they may say many years, on some soils, if well managed and manured, to get a good pasture. That there were a great many acres of land in this country that might pay much better as pasture than it did as arable, there was little doubt; but the time and expense that were required to get a good pasture was a great drawback even to an owner, much more to a tenant farmer; and from experience he believed that much of the land now being laid down would produce more and pay better under the plough by farming for roots, &c., for sheep and cattle, with some corn, than it could do for very many years to come as pasture. It was very questionable whether much of it would pay for the trouble and expense, and if they looked back at the improvements made by agriculturists of this country in the last sixty years, it would be found that the increase of beef, mutton, &c., had been more from the improved system of farming arable land, by growing root and other green crops—Norfolk and Lincolnshire to wit—than from all that had been done by the increase of, and improvements in, meadow and pasture land. He therefore thought it would be well to look at the improvments made in arable land in many counties, before they went to the expense of laying down too much as permanent pasture.

Second—On the sowing more small seeds by farmers: There was, he thought, at the present time, and he might say had been for some years, a great error made by the farmer, more so now the price of wheat was so low, in not sowing more clover, sainfoin, and many other seeds, that they could sell or exchange with each other, instead of buying seeds that came from foreign countries, which they knew nothing about, and which, often, if the seed would grow, many of them rarely brought a good crop, particularly clover and sainfoin. To the honor of the agriculturists, he could say that he had never, that he could remember, been deceived by them. He wished he could say as much of the dealers and mixers. The losses sustained by bad, and he might say bad sorts, of small seeds must be very great; and the more extended growth of seeds by the farmers generally, would be of very great benefit and advantage to them, as the entire failure of a plant of clover, &c., or of a thin or half-plant, which is often nearly as bad, in causing the land to get foul, often proved a most serious loss.

Third—On the keeping a sufficiency of farm horses in good condition for work: That it must be a pleasure to a farmer, or any one who kept a horse, to see it in good condition for a good day's work, all would agree; and they might often judge of a man's well-doing, particularly in agriculture, by his horses. That much was lost by keeping them badly, was certain, and what was often the reason assigned?" Because they consumed so much of the produce of the farm; at the same time a farmer would keep cattle to fatten on a farm not adapted for it; would buy artificial food for them, and also consume much of the hay, &c., grown on the farm, sometimes at a loss, to make manure for his land, and by so doing would get his horses out of condition, to the detriment of his farm and his pocket; when, by feeding his horses well, he would often make as much and better manure with his horses. And often there was not enough horses kept for the work there was to do. He was inclined to think there was more money lost by not keeping enough than by keeping too many, so that many things got neglected and not done at all, or only half done; and he always found overworking and underfeeding horses a losing game. His reason for making these few remarks was because he saw so many farm horses, particularly on small farms, that were not near up to the mark. He mentioned the error of fattening cattle, sheep, &c., on soils and situations not adapted for it. The farming for stock sheep would be a more profitable method on many such localities for the pocket, as well as manuring the farm; and let the good pastures and warmer situations fat for the butcher, which would mostly prove a benefit to both.

Fourth—On the losses sustained on thrashing corn out of doors: The losses from the present system so generally, he might say universally, practiced of thrashing corn in the South of England, was a great evil—almost a sin. The waste of straw, caving, and chaff, sometimes unavoidable, but oftener from the insufficiency of hands to secure it as thrashed, and often the straw stacks, not being thatched at all, must be very great. The system pursued by many, of tying the straw in a single band, was often objectionable, as it was often done in such a hurry, and stacked so badly, that it was much more likely to be injured, if not immediately thatched, than if stacked loose; if well built and raked down hard, it would not be so much injured if not thatched at all. Although all stacks, unless immediately wanted for use, would pay a good interest at all times for the money expended in securing them from wet, and if the losses sustained could be ascertained, he thought there would be few stacks left unthatched. It was very questionable if the thrashing the whole of the produce of the land by steam in the south of England was the best policy, even if it really was so in the north. The losses were so great, and, as he had said, often unavoidable, that if a portion of it was thrashed in the old way by the flail, the straw, chaff, &c., would be found to be of much more benefit, particularly in the present season, when the hay was so scarce and dear. He must say that if there was a good floor or two to the barns, that it would be a great saving to have men to thrash during the winter months at any rate; and especially on small farms it must be much to their advantage to thrash a portion, if not the whole, of the corn in the old way.

Fifth—On the necessity and use of clear or whole summer fallows: He was going again to address them on the necessity, use, and benefit of summer fallows. What in that room was said by one member, if not more, to be a sin, when he addressed them before on the necessity of fallows, he would endeavor to show them that good and profitable farming could not be carried out without them, and that it was really necessary, particularly on many farms where hops were grown—many of which were but very middling for growing corn or anything else, as the hops require so much of the manure, that little could be grown without fallows. Some of them might say that there was plenty of manure to be got; but it was not so, and for many reasons, as a great many farms were taken by men of small means, particularly poor ones (as men of capital knew better than to take them), that they could not, if they were so inclined, farm and manure them to the best advantage, or as many of them would like to do. But allowing that men of capital could be found to take them, he would like to know where all the manures were to come from, as not only were all the manures made in this country put on the land somewhere, but an immense quantity of artificial manures, many of which were of little or no use, were brought and used for that purpose. They sent nearly all over the world for bones and many other things, and the demand for them was so great that they were continually getting dearer. And who was it who got the best of the guano, bones, &c.? The men of capital, who used the best land, which must tend to get the worse still poorer; and he should think there were but few counties in the United Kingdom to which these remarks would not apply. Now, if they admitted that he was right in his ideas, how were the poor, heavy-land farms in the country to be farmed with any benefit to the occupier, without summer fallows, he would like to hear, and also how a large portion of the better land could be managed to the best advantage, without them? He still believed that they could not, and that the land required rest to produce the greatest and best continual good crops, as much as men and horses required rest on Sunday. It seemed to him to be the law of nature that it should be so, and that they should grow more by carrying out that law, and keep their farms very much cleaner. Many might sk, what was the use of the fallow to the land?—why should it be idle the whole year? He hoped he should be able to show them that it was of use in many ways, and that it was really essential to the full development of the soil. In the first place, why was it they heard so much of the wire worm, slug, and many other insects, eating up and destroying the crops, and of the thistles and other weeds growing to the extent they did, and impoverishing the land, that they could not get the turnips, swedes, clovers, &c., to grow as they used to do? He believed the grand secret lay in the continual cropping, without fallows. What could they do to exterminate the insects, weeds, &c., so effectually as a whole year's fallow? No six months' good preparation for roots could have the effect. However they may use the hoe and other implements, they could not starve the insects and destroy many of the weeds so effectually in any other way. So that for the want of a small portion of fallow, on nearly all soils, they often obtained but a middling crop. What effect had the present bad crop of turnips, swedes, &c., on the land sown with them this season? It was full of grubs and worms, but they would not find them in a clean fallow. He had said in that room that any farmer might find out what manures were most suitable for the land he used, by simply trying several sorts in a small way, say one rod, or one land of each sort, and come to as practical and profitable results as if he tried acres or fields, and, he thought, more so. Just the same with a whole year's fallow. Let any one try one acre of a field intended for turnips, &c., or where he intends a crop of peas, &c., and mark the result in four or five years' rotation, and from his own experience, he firmly believed, if universally carried out, at the end of five years there would be more clean fallows in one year than there are now in five. Although he advocated fallows, at the same time he thought that very much of the land was plowed more than was necessary, and that if the scarifier was more used, as it was by Mr. Marmaduke Walker and others, a great saving would be the result, and often better crops. And he was still of the opinion that he had expressed there, that many of the foul fallows intended for turnips and other roots were plowed too deep (if not cleaned in the autumn), and that they would be much easier and more effectually cleaned by being plowed only half the depth or even by rafting—that is by putting one half on the other—or only half-plowing, and when cleaned in the spring plowed to the depth required, as the summer sun would benefit the soil more than the winter frost and snow, although both might be beneficial. Sixth.—On the finding constant employment for agricultural and other laborers, and the benfit that must ensue if carried out: That there should be any able-bodied men out of employ, even in the winter months, saving when the weather is such as to hinder them from doing what they may have to do, seems a state of things that ought not to be, in such a country as England, abounding in wealth. What was the cause of so much immorality, misery, and crime? There must be some, perhaps many causes for it. Some talked of insufficient and bad cottage accommodations, the number of beershops, and other things, as the cause of the immorality of the laboring population, which they no doubt were in a great measure; but the want of constant employment in the short days had been the cause of more immorality, misery and crime, than all other things put together. This state of things was not of modern date, but had been practiced for a number of years, when farming was a much better business than it was now, which he should be able to prove; but as machinery got more generally in use, there were far more agricultural laborers out of work in the short days than there used to be. Mechanics were thrown out of employ to a serious extent, as well as the farm-laborer. Why should such a state of things continue? Was there no work that could be done for the landowners, tenants, and others that would benefit them? Or, are the days so short that they cannot earn their money

He hoped and trusted he should be able to show them that it was a loss to themselves, a degradation to the laborer, and one of the greatest national evils of the present day. What was it that caused many gentlemen, as well as farmers, to do with as small a number of hands in the winter months as they possibly could? There was much work that might be done as cheaply in the short cold days as in the long hot ones. He was satisfied that a man could either by the day or the piece do as much work in eight hours in the winter as he could in twelve hours in the summer, and with less fatigue. And how many things might be done, such as grubbing, digging, filling, and spreading dung, mold, chalk, marl, &c., where it would do good, and which was known to pay on many soils! Besides, if things were left to the spring, how many things were left undone altogether! Mechanics could do many things to expedite the work in the spring, and which would be much better, both for the employer and employed, than to get them to make eight days a week in the summer months, and earn so much that often some of the best hands keep "Saint Monday" a great part of the week, to the injury of themselves and employers. And no charity, ever so bountifully and properly bestowed on our able-bodied labor, could be so great a boon to them as to find constant labor at a fair remuneration. That it must be good policy on the part of all classes—noblemen, gentlemen, and all, whether engaged in agriculture, trade, or commerce—to create as much employment as they could possibly in the winter, there could not be two opinions. When they saw the amount of money expended on able-bodied men in the unions, and for unproductive labor, which in the sixty-four years of the present century must have been immense, if it stopped it would be well; but taken in a broad and national point of view, what had it done? It had been the principal cause of thousands of their best laborers becoming poachers, which generally resulted in crimes of deeper dye, and ended in imprisonment and transportation or something worse, which created expenses severely felt by all classes, but more particularly by the landed interests of the country, in poor, county, and other rates and taxes. Seventh.—That the limited use of both lime and chalk of late years in the process of agriculture, and the want of it, began to be felt on very many soils, and was one of the principal causes of so much of the land, even with good farming, often disappointing them in not obtaining crops as good as they felt they had a right to expect. If they walked over even the light soils in that neighborhood, they found that, a number of years back, large districts had been chalked from draw-pits, which had now entirely disappeared and sunk below the soil; and were it not for the sinking of the earth at some of these pits they would never have supposed that chalk had ever been applied to the land. Lime and chalk were known to be such sweeteners and purifiers to the land on most soils, that he thought there could be little doubt that a general use of them would much improve their root, clover, and other crops, and that it was really what they required. If they would allow such was the case, what a field it opened for a great portion of the surplus laborers of this country in the cold winter months! Surely, such a state of things as he had described could not be allowed by the landlords and tenants of their favored country to continue any longer, and all who wished for its well-doing would set their hearts and minds to work to find as much labor as they possibly could, to employ their increasing population in the winter months.

INFLUENCE OF CLIMATE ON CULTIVATION.

BY R. RUSSELL, F.R.S.E.

This subject has already been somewhat generally discussed. In treating the subject, we shall divest it, in the first place, of all technicalities or reference to meteorological figures. On a future occasion we may take up this particular branch of the subject with the view of simplifying and bringing out more graphically the variations of temperature and humidity. Indeed, we are of opinion that the ordinary methods of instrumental expression of those elements which constitute the peculiarities of climate are anything but satisfactory.

At present, however, it is our object to deal with those branches of the subject which are strictly practical: to state as concisely as possible the influence of climate on the growth of those plants that are principally cultivated; to trace the varieties in the agricultural practices of different localities, induced by differences in their climatic conditions; to point out the varieties in rotations, cultivation, and manuring of crops, which certain climatic conditions favor.

It should be kept in view that other elements often override those of climate, and are chiefly concerned in forming our agricultural systems. Thus, in all parts of Britain, the demand for particular crops, with unlimited supplies of manure, render farming much alike in the neighborhood of large towns. It is in inland districts where the features of distinct systems stand out in boldest relief. There we generally find that those crops are most cultivated which are most suitable to the soil and climate. Yet to this rule there are many exceptions, owing to what may be termed the practical economy of cropping. Thus turnips are well known to thrive best in the cooler and moister parts of the British Islands. The climate is far more suitable for turnips in Scotland and the West of England than in Norfolk. It has often appeared to many a curious circumstance, that turnip culture should have begun in the eastern counties and extended to the north and west. In no part of Scotland is a fourth part of the arable land devoted to the culture of turnips, as is the case in Norfolk. In the West of England and Ireland this crop is only slowly making its way, as the pioneer of better cultivation. It is an expensive crop to raise, and, when done so to such an extent as a fourth of the arable land, it demands a correspondingly larger breadth of the higher priced grains. This is a resource which neither the Scotch nor the West of England farmer can fall back upon. Literally speaking, they cannot afford to grow so large a breadth of turnips as the Norfolk farmer, in consequence of not being able to grow so large a breadth of barley and wheat, which are the most valuable grain crops. Other compensations, however, intervene, and enable the Scotch farmer to pay as high a rent for land of equal fertility as the Norfolk farmer can do.

Chemistry teaches us the changes which matter undergoes in passing from the inorganic to the organic kingdom; the laws of physiology, the functions of the various organs, as well as the nature and uses of the products that are formed; the laws of climate, the conditions under which the different kinds of plants flourish or produce their various products in greatest abundance and perfection.

Other things being equal, the force and rapidity of vegetable growth is in proportion to the temperature of the atmosphere and soil. It is well known that plants grow with greater vigor in summer than in spring—in tropical countries than in temperate. The higher temperature enables plants to digest or assimilate a larger quantity of food in a given time. Plants are therefore far more grateful for a supply of manure when applied for summer than for spring growth. The vegetables raised by the market-gardener are said to be "forced by manure," because the common kinds are grown during the colder period of the year.

But not only have plants the power of digesting a larger quantity of manure during the warmer season, but they seem also to have much greater powers of absorbing food from the atmosphere. This may arise from two causes. First, it is highly probable that ammonia, a most active agent in producing vegetable growth, exists in greater abundance during the warmer season—its quantity in the atmosphere being to some extent regulated by that of its water or vapor, which is always greatest in summer. The second cause of the greater powers possessed by plants of absorbing ammonia during the warmer season is perhaps the increased vigor of the plants.

When manure is abundant, the agriculturist endeavors to select those plants which are capable of expanding in size in proportion to the liberality of the treatment. This can only be fully accomplished when their period of growth extends over the warmer season. These conditions are fulfilled in the meadow under irrigation, or in a field of cabbages; both grow so long as the temperature is sufficient for vegetable growth, and both possess great capacities of growth under liberal treatment.

The amount of food which plants can derive from the atmosphere appears to be regulated by principles which are not very dissimilar from those which hold with respect to the capacities of plants for manure. The capabilities of plants for absorbing food from the atmosphere depend upon the extent of surface of healthy succulent leaf which they can maintain during the season of growth. Under favorable circumstances, grass and clover send forth a perpetual succession of leaves, which renders them much less dependent on a supply of food to their roots than the wheat plant. Or in the case of the natural vegetation of forests, which yearly produces a great amount of organic matter, through the large surface of leaf exposed during the warm season.

The suitability of climate for forage crops consists in its capability of maintaining them in health throughout the growing season. Within certain limits, the strength of vegetation depends upon temperature, if a due supply of moisture exists. When moisture is deficient, assimilation is retarded or prevented, and the most abundant supplies of food are of little avail in promoting growth, Much of the skill of the agriculturist consists in selecting those plants which are best adapted to the climate, as well as in adopting those particular acts of cultivation that serve to compensate for deficiencies of climate.

One of the principal properties that render soils fertile is their power of absorbing and retaining moisture, and thus furnishing a steady supply to the plants that grow upon it. One, also, of the chief objects of cultivation is to increase this power, and by this means increase their productiveness. As we shall have occasion to point out, climate greatly influences the maxims that guide agriculturists in this matter.

The physical or mechanical properties of soils are chiefly concerned in the distribution of the natural vegetation, such as trees and grass. Blowing sands on the sea-coast are tenanted by those species of grasses that can resist the extreme aridity of the medium in which their roots are fixed. It is only on deep loams that the finer and more luxuriant grasses flourish in dry climates. These can sustain growth during the heats and droughts of summer; except by the operations of drainage and marling, art can do little to increase the absorbent powers of a field under grass. Deep-rooting plants, such as clover, sanfoin, and lucerne, are less under the influence of drought, and are consequently greater objeets of culture in dry climates. On the other hand, the humid climate of the West of England renders it particularly genial to the growth of the shallow-rooted grasses, which become an economical means of restoring fertility to land exhausted by cropping.

The influence of climate on the growth of the common perennial rye-grass may be said to cause one of the peculiar differences between the rotation of Norfolk and that of the north and west of the island. This is a valuable pasture plant in Scotland and the West of England. In these parts the climate promotes its continuous growth throughout the summer. As it is cropped it tillers freely, sending out fresh stems and roots, and occupying the land to the exclusion of weeds of all kinds. It stores up within the soil organic matter, which yields on decomposition abundant food for other plants.

Pasturing seeds for two years is very generally regarded as a safe and sound system of maintaining fertility in Scotland and the West of England. Such a practice is usually prescribed in leases as well calculated to fertilize the soil and husband its resources: of course this is only done to advantage on easy loams which maintain grasses in a growing state. Tenacious soils seldom support good grasses a second year, and then only when the indigenous kinds come up; for they seem to be unfitted for rye-grass in consequence of the treading of the ground by cattle or sheep being inimical to the healthy functions of the roots. Pasturing seeds for two years may be regarded, in a lesser degree certainly, as improving soils in the same manner as consuming on the land a crop of turnips for two years in succession. The economical advantage of pasture being that it involves no expense in manure and cultivation.

Rye-grass is an inferior plant in all the drier districts of England: being a shallow-rooted plant it is ill-provided for maintaining itself in vigor during the heats of the summer months. Clovers or other plants with deep roots have an immense advantage over it in producing forage; but the want of good artificial grass to take full possession of the surface soil in Norfolk, and maintain its growth in summer, allows other useless and unprofitable plants to spring up. Instead of the land improving in fertility by two years' pasture it becomes filled with weeds as the clovers thin out; this, it appears to us, is the principal reason why the four-course shift has been so long followed in Norfolk, and the five-course in the West of England and Scotland. This forms a dividing ridge between the two systems; and the spirit of each, as exhibited in other farm practices, pursues somewhat opposite courses—which it is our object to trace.

The four-course shift is necessarily much more expensive than the five-course. Though the climate of Norfolk is inferior to that of the north or the west for turnips—the most expensive crop that is cultivated—still a fourth must be given; another fourth must be sown out annually with seeds; one-half of the land also is annually under the exhausting influence of white crops: all which involves not only great expense in cultivation, but in manuring. Under the five-course the expense of culture is less; and being more self-sustaining by pasturing seeds two years, it costs less for manure. The truth is, neither the Welch nor the Scotch farmer can well afford to grow so great a proportion of turnips as the Norfolk farmer does. Wheat cannot be sown with advantage after seeds in moist climates; it is difficult to obtain a large breadth of this crop after turnips: inferior priced grains must therefore be resorted to. A smaller gross produce is obtained at less expense. That this must be so will be rendered sufficiently apparent in looking at the aggregate sum which is likely to be derived from the produce of the grain crops in the course of a twenty years' lease under the four and five-course shifts. During that period, on a farm of 200 arable acres, the Norfolk farmer would raise—

1000 acres of wheat, say 4	quarters an acre,	4000 quarters	at 50s.	£10,000
1000 acres of barley, say 5	" "	5000 "	at 30s.	7,500
Being a total for grain crops of				£17,500

In Scotland and the West of England, oats must succeed the grass, and wheat and barley the turnips. In a twenty years' lease of a farm of 200 acres, under the five-course shift, there would be raised—

300 acres of oats	at 6 quarters,	4800 quarters	at 25s.	£6,000
400 " barley	at 5 "	2000 "	at 30s.	3,000
400 " wheat	at 4 "	1600 "	at 50s.	4,000
				£13,000

If we assume that the value of the land is the same in both cases, it is evident that the same rents can only be paid by the Scotch farmer by the inferior crops involving less expense in cultivation. So long as he only raises the common grain crops he cannot afford to farm so high as the English farmer, seeing that the limits of production are sooner attained. The English farmer finds it profitable to consume large quantities of cake and inferior grain in the feeding of stock for the purpose of enriching his manure-heap; but it could be easily shown that the margin for profit would be hardly less were he only able to grow those inferior kinds of grain which he uses in feeding. It is for this reason that, so long as the Scotch farmer relied on paying his rent by selling fat stock and grain, he never could afford to farm so high as the English.

It now remains for us to point out, a little more in detail, the elements of climate which determine the particulars of the opposite systems which experience has established. This can only be effectively done by contrasting the requirements of the various crops, with respect to cultivation and manuring, under various climatic conditions.

The most striking and marked difference in the cultivation of cereal crops in moist and in wet climates is exhibited by the place which wheat occupies in the rotation. In moist climates it thrives best after a bare fallow or green crops, in dry climates after seeds. Throughout Scotland, Ireland, and the West of England, wheat is a somewhat precarious crop after seeds, and accordingly oats are in general substituted for it. It is somewhat difficult to account for this well-known fact, but there are probably two causes which are the principal in operation. In the moister climates the straw of wheat, unless in particular soils, seldom assumes a fine healthy color when sown after seeds. The fresh decaying vegetable matter has the effect of producing a certain grossness in the plant which is not thrown off by the greater amount of direct sunshine that prevails in the drier climates. It is weaker in winter as well as in spring, and a thin plant is a frequent result, arising from depredations of insects or otherwise.

When the climatic conditions are thus less favorable, the health of the wheat plant is greatly promoted in its early stages by the soil being better prepared. Land that has had a summer fallow, or the benefits of cultivation which a root-crop insures, is in a much better state for allowing the young plants to run through the soil and gather food than after seeds. Wheat sown after green crops, such as potatoes or turnips, produces a more healthy plant and finer quality of grain than when sown after seeds.

Another still more palpable reason for wheat not succeeding so well after seeds in moist climates is the greater vigor of the grasses. These are worse to extirpate, and any that remain in the soil are not kept in check by the wheat plant in spring and early summer: the grass consequently grows up among the wheat, and the land is left in a foul and unthrifty state. When oats follow grass, the result is very different; they are sown broadcast over the ground, and a liberal allowance of seed insures a thickly-planted crop, which having the start of the grasses smothers them, or, at all events, prevents their growing with much vigor. To such a degree is this the case, that Mr. Acland, in his Report on the Farming of Somersetshire, mentions that, after grass, oats are taken to "clean the land," as the farmers say, and permit its being sown with wheat the succeeding year.

No plant seems so dependent on the physical properties of the soil as wheat; more especially in dry climates. One of the causes, therefore, of wheat succeeding better after seeds in these, is owing to the remains of the stems and roots of the seeds making up to a certain extent for the physical defects of the soil. It might be thought that this manuring in the vegetable form would chiefly act by retaining ammonia within the soil until it was decomposed and taken up by the roots of plants. By acting in some measure in fixing the nitrogenous substances, the vegetable matter might be supposed to prevent the wasting effects of rains: no doubt it does that also, but then it must be remembered that vegetable manuring answers best in the driest climates where there is least waste from washing. Mr. Hannam states this very strongly, in his article on green manuring, in "Morton's Cyclopædia of Agriculture:"—"It is only after a good crop of depastured seeds that a full crop of wheat can be grown upon the high and dry wolds and the limestone and chalk hills that are brought into cultivation in this country (south-east of England). After turnips, barley upon such soils succeeds, but it is only upon lea that wheat can succeed fully, when the texture of the soil is light. No doubt manuring will answer upon fallow." The decaying vegetable matter seems to improve the physical texture of the soil by its attraction for moisture: it also, to some extent, regulates the supply of ammonia to the plants, by only slowly yielding it up—a matter of much economy in the feeding of plants. These influences combined have the effect of sustaining vegetation in a comparatively healthy state during periods of drought. Though the necessity for vegetable manuring is most strongly marked for wheat on light soils in dry climates, still all other crops exhibit its beneficial effects under similar circumstances.

The necessity for seeds as a basis for a full crop of wheat is not so much felt where the soil is argillaceous, even in dry climates. Soils of this character, by their retentive properties for manure, can maintain the plants in a healthy state during periods of drought. The ammonia being also absorbed by the soil and rendered in a great measure insoluble, is only taken up by the roots as the plants require it; but as the climate becomes more moist, and just in proportion as it can better sustain the healthy growth of grass on light soils, so can it also that of wheat. The increased moisture compensates in both cases for the physical deficiencies of the soil, and the beneficial effects of green manuring are less apparent. Vegetable matter may be regarded not only as a good absorbent of moisture, but as the best dilutant of ammonia in a dry climate; in a moist climate it is less needed for these ends, and its efficacy is not so striking or marked.

These considerations are by no means in contradiction to the successful results of applying soluble manures—such as the nitrates or salts of ammonia—to wheat crops in dry climates. The last number of the Journal contains an admirable summary of numerous experiments on manuring wheat on the light lands at Holkham. No doubt clover lea forms the basis of success, which so far as regards the nitrates is dependent on their application at intervals during the growing season; more especially during periods of moist weather, when the plant is in circumstances to turn it to the most advantage. It is not in dry seasons, when the soil is least liable to suffer from being washed by rains, that these soluble substances are most efficacious; but in wet seasons, when the real waste from such a cause should be greatest. Mr. Read, with his usual practical sagacity, justly remarks:—"Holkham is not the *natural soil for wheat.* In those wet seasons when there was so poor a wheat crop throughout the kingdom, the nitrate of soda produced the greatest results. . . . . The nitrate of soda and salt are best applied in two dressings: the first when the wheat takes its early start in February or March, the rest some time in April, when the wheat is growing vigorously."

The moister the climate, the more "natural" do light sandy soils become for the growth of wheat. The less necessary also is vegetable substance, as a means of sustaining growth. The plants in all cases feed on the same substances; but they are only yielded slowly up when applied in the vegetable form, which in some measure supplies the plants with a daily portion of food. This we can easily imagine is consistent with the most economical application of manuring substances. A large supply of nitrogenous substances existing in the soil in a fit state to be taken up by plants, can only be economically worked up when they have a due supply of moisture.

In moist seasons the English practice of sowing wheat after seeds no doubt aggravates their effects on the crop. The straw is more liable to become diseased than when it is sown after root crops. Under other circumstances this is still more strongly marked in practice. Indeed all our Scotch and English notions respecting the qualities of soil best fitted for the wheat plant are in a great measure set aside in North America, where the climate is entirely different. There the winter is so cold that the plant is completely checked in its growth until the summer bursts in at once. This season sets in hot as well as moist, and soils of light texture can sustain the growth of the wheat plant. Sandy soils thus become in the eyes of the American farmers quite "natural" for wheat. On the other hand, those which contain vegetable matter in large proportions are wholly unfitted for the growth of wheat, as it becomes too luxuriant and liable to disease.

It has been already stated that, in the presence of sufficient moisture, a higher temperature will go far to compensate for a smaller quantity of manure. The reverse is likewise true; a deficiency of heat is, to a certain extent, made up by a larger supply of manure.

It ought also to be observed that manure and temperature have somewhat similar effects on the flowering of plants. A deficiency of temperature or of manure hastens the flowering processes, while a high temperature or an excess of ammonia retards them. These effects form subjects well worthy of careful analysis in estimating the influence of climate on the growth of crops.

A high temperature hastens the ripening of a plant after it arrives at a certain stage in its growth, but it has been generally overlooked that it has a precisely opposite one on its early stages. A turnip or a wheat plant has comparatively little tendency to seed when sown on rich soil in the month of June. Both, however, run rapidly to seed unless highly manured when sown in March. All plants seed soonest in the poorest parts of a field. Cold nights have a great effect in developing the seeding of plants; ammoniacal manures retard seeding by stimulating the growth of stems and leaves. Cold and drouth then act to some extent in a similar way, by preventing plants from obtaining and appropriating a full supply of food.

It is also worthy of being kept in mind that when the climate encourages early maturity, it also has the effect of producing a smaller yield. What is gained in time is to a certain extent lost in quantity. The rapidity with which any annual comes to maturity is not favorable to its productiveness. In those cases in which earliness and productiveness do go together, liberal manuring must be resorted to. Manure is so far an equivalent for time.

In conformity with this principle, the productive powers of wheat are greatest in moderately cool and moist climates. Under these circumstances the plant expands more fully. By retarding its flowering tendencies, its stems as well as ears are formed upon a larger scale, and it is capable of yielding more on a given space. For this reason the wheat plant attains about its maximum powers of production in Great Britain, in those districts where the climate favors its ripening. On the other hand the productive qualities of wheat gradually decrease as the latitude lowers.

As a general rule too—one that, so far as we are aware, does not admit of any material exceptions—the latest varieties of crops are generally most productive when the supply of manure is moderate. This is not so well exhibited in wheat as in some other plants which we shall have occasion afterwards to point out, but still we can trace the principle distinctly enough. The longer the time that the leaves of any plant can present a green and fresh surface to the atmosphere, the more can it not only rely on the atmospheric supply of food, but the more food can it appropriate from the soil.

The success which has in some few instances attended thin and early seeding of wheat is no doubt partly attributable to the lengthening of the period of growth. It exhibits in fact all the characteristics of a later variety. The individual plants, having more space to expand their roots in, form correspondingly large stems. The increased scale on which the plant grows enables it to maintain a larger absorbent surface of leaf. The seeding tendency of each plant is retarded by the larger supply of food furnished. Its lateness also causes its growth to take place to a greater extent during the warmer season, when the absorbing powers of the leaves are greatest. These elements no doubt contribute to the success of growing wheat at Lois Weedon with so little expenditure of manure; and whatever may be the other elements of success, these can not be left out of view.

The practical effects of thick and thin seeding have been philosophically treated in the farming essays of Mr. Mechi and Mr. Hewit Davis. Thick seeding, by limiting the amount of moisture and manure to each plant, hastens its flowering processes. It need hardly be again observed that a deficiency of moisture and a deficiency of manure are similar in their effects upon plants: the want of moisture renders the presence of manure of little avail. Both, therefore, favor the early maturity of plants, which is well known to accompany thick seeding. Thin seeding, on the contrary, whatever may be its other disadvantages by limiting the number of plants and extending their growth over a longer period, is a means of economizing both moisture and manure.

Temperature, humidity, manuring, and the physical properties of soils derive a considerable amount of fresh interest on viewing their effects on the growth of the wheat plant when sown in spring. A low temperature during the early stages of the common and finer varieties of wheat seems quite as natural to its productive powers as a high temperature to ripen it. When wheat, as already stated, is sown in warm climates or in summer, it exhibits little or no tendency to flower. In North America, where the heat sets in so suddenly after the cold of winter, none of the common varieties are sown in spring, as few of the plants will in that case produce seed that summer. The same circumstance is observed in the south of France; and even in the south-eastern counties of England, when the time of sowing is somewhat delayed, the plant puts forth a profusion of stems and leaves, and the high temperature, instead of pushing the plant rapidly into ear, at that stage of its growth, has a precisely contrary tendency. It no doubt has such an effect on a plant sown in the end of February or beginning of March, for the cold at that season fully develops its seeding tendencies. The cold nights and warm days, which are the characteristics of the climate of the eastern counties at that season, hasten it on so much that a full plant is difficult to obtain, even with a liberal allowance of manure. Hence these combined influences render spring-sown wheat anything but a productive crop on medium soils in the eastern counties ot England.

In the western counties and in Scotland, the climate is much more favorable to the growth of spring-sown wheat. The less stimulating temperature by day and greater humidity prolong the growth of the plant and develop it upon a larger scale, so as to produce much heavier crops with the same amount of manure. Light soils too, more especially in the west of England, sustain its growth. So much is this the case, that wheat almost grows as freely as barley, and it possesses one great advantage, that it is not so liable to lodge with rains. Any one who has read with ordinary care Mr. Read's account of the Farming of South Wales must have been struck with the contrast which it affords on this point of farm practice, when compared with Norfolk experience.

The experience of Scotch farmers is somewhat similar, with regard to the raising of spring wheat, to that of the Welsh farmers. East Lothian no doubt brings the crops to greatest perfection. It produces a fine sample of grain, and it also in general yields well. In many districts it may be sown at considerable elevations, but in such cases it is somewhat affected by cold and retentive subsoils. On these the plant usually lacks vital energy, it is long in ripening, and the quality of the grain is poor. The temperature in Scotland is little more than sufficient to bring spring-sown wheat to maturity, which circumstance renders the influence of soil very marked. The broken and irregular surface of the northern part of the island furnishes a great variety of soils as well as climate, and nowhere can the reciprocal influence of the two be studied to better advantage. This is a subject, however, that our limits forbid us from touching upon, otherwise than in the most general and cursory manner.

In the fens of Lincolnshire spring-sown wheats grow with great vigor.

The soil being moist sustains vegetation in a dry and warm atmosphere, and up to the period of flowering the crop is usually most promising. Such luxuriance is, however, almost invariably deceptive, as rust and mildew usually destroy the crops before they ripen. Unless the soil is remarkably sound, luxuriant growths called into action by thin seeding or late sowing have a tendency to produce mildew in the warmer climates. Thin hoeing the wheat crop in spring on the light soils of Norfolk is now generally abandoned, in consequence of the slight covering of the plants which takes place in the operation having the effect of encouraging late tillering. Owing to the late tillered stems being more luxuriant, from having a higher temperature to grow in, they are frequently attacked with blight before they ripen, and an irregular sample is the result.

The eastern counties possess a climate much superior to the west of England or Scotland for the ripening of wheat. The rich golden hue which the crops assume in the former just before harvest, is only seen in the latter in the finest seasons. It must not be assumed, however, that the lower temperature and more humid atmosphere of Scotland render it better suited for the growth of oats and barley than for wheat. No doubt, under the necessity which the climate imposes upon the Scottish farmer to sow oats instead of wheat after seeds, it is more difficult to have such a large proportion of his land under the wheat crop. Inferior grains, such as oats and barley, are raised at less cost in culture and manure, and yield as great a net produce. That, during a series of years, the wheat crop brings in the largest money return to the Scottish farmer, is well brought out in a table in the appendix to the "General Report of the Agricultural Society of Scotland," by Sir John Sinclair. An account is given of the produce of wheat, barley and oats, on an imperial acre, for fifteen years—from 1781 to 1795—on a farm in Clackmannanshire. The average produce and average value were as follows:

		£.	s.	d.
Wheat, 30 bushels	value	7	13	9¾
Barley, 35 "	"	4	17	11¼
Oats, 37½ "	"	4	6	0¼

It ought to be observed that the produce of both oats and barley per acre vary more than that of wheat. Thus, the best crop of wheat was in 1790, the produce being 34 bushels to the acre; the worst in 1788, the produce being 20½ bushels. In 1788, the produce of barley was 49½ bushels to the acre, but fell as low as 10¾ bushels in 1782. In 1791 the produce of oats was as high as 48½ bushels, and in 1782 as low as 23¼ bushels.

Wheat, when sown in autumn, upon a sound and well-prepared soil in Scotland, is really less under the influence of those agents that affect the produce of the spring-sown crops. This was more especially the case in former times, when it was the general practice to sow oats and barley later in the season; for in these circumstances the crops are much more liable to be affected with drought or heavy rains during the seed time. A crop of autumn-sown wheat on a good soil is comparatively independent of spring droughts, and the chief risks which it runs are bad blooming and ripening seasons.

The effects of climate on the growth of the *barley* crop will now be considered. These are even more marked than in the case of the wheat crop, and afford still more striking illustration of the effects of temperature, humidity, and manuring, of which we have endeavored to trace the separate influence in the case of the wheat crop. The climate of the eastern counties exhibits a far greater superiority over other parts of the island for the growth of barley than for wheat. The Scotch farmer may often grow as fine quality of wheat as the English, but, unless in a few localities, the inferiority of the barley is very manifest.

Wheat, too, when sown either in autumn or in spring, will bear an amount of forcing in moist climates, under which barley in the same circumstances will fall down and yield a poor return. On all the secondary climates in Scotland, where the soil is suitable, wheat is invariably substituted for barley as the treatment with respect to manuring becomes liberal; for it must constantly be borne in mind that, unless from local circumstances the farmer in a moist climate can advantageously sell a portion of the green crop off his farm to remunerate him for a liberal expenditure of manure, he cannot expect a remuneration from increasing the produce of oats or barley; even at best, the partial substitution of wheat for barley must be carefully gone about. In moist climates, instead of farmers growing a large breadth of green crops, it is more generally the practice to grow white crops in succession, as they can be raised with less expenditure of manure.

Thus Mr. Garnet, in his "Report on the Farming of Lancashire," says, in regard to one district of the county:—"The rotation of crops which is now adopted with success in working and restoring the land is a five-course, as follows:—1. Oats. 2. Oats. 3. Green crops manured, turnips or potatoes. 4. Oats or barley with seeds. 5. Seeds for hay or pasture." Mr. Tanner, "On the Farming of Devonshire," remarks:—"The rotation of crops adopted in this country is known as 'the old Devon course,' or turnips, wheat, barley, oats, seeds, two to six or more years." Mr. Read, "On the Farming of South Wales," states:—"Experience has proved that, on the better lands, barley, after a drawn crop of turnips, will frequently lodge. Even Mr. Morgan, in his prize essay on the 'Cropping of Pembroke,' admits 'barley on some soils is not a safe crop after turnips.' Although the following course cannot be defended on the principles upon which the rotation of crops are founded, yet it is practically found to be one best suited to the good land of this district:—1. Turnips. 2. Wheat. 3. Clover. 4. Wheat. 5. Barley. To give a few specimens of the rotations pursued in Ireland when Arthur Young made his tour through the country, would only show still more strikingly, the facility with which a succession of white crops can be taken in moist climates, and the general neglect of turnip cultivation."

Barley, like every other crop, the later it is sown in the spring, the less manure it requires to produce a given quantity of grain. Where it is the custom to take repeated crops of grain, late sowing is invariably had recourse to, as a means of augmenting the produce. Mr. Read, in his "Report on the Agriculture of South Wales," states that "the season for putting in barley is generally from the first week in April to the middle of May."

In the south of England, where the heat of summer is greatest and the drouth most severe, barley of fine quality is rarely obtained, if it is put into the ground later than the middle of April. Even in favorable growing seasons the crop rushes up too rapidly, and the high temperature of July forces it on to maturity: as a consequence, the grain is hungry and inferior in quality. In fact, in ordinary seasons the forcing character of the weather is such in the south of England that the spring crops usually ripen much about the same time, whatever may have been the time of sowing.

It is, therefore, of prime importance to sow barley early in a dry and forcing climate. When the land is well manured, it pushes the plants forward, although the season is cold and ungenial. The earlier, in fact, that the crop is sown, the more does it show the advantages arising from winter sowing. Mould pulverized by frost is best fitted for retaining moisture: the straw, too, from having had time to take a full supply of earthy matter, is said "to contain more bone," and is altogether more healthy and of firmer texture, which enables it to withstand the effects of rains. But perhaps the chief advantage arises from the seeding tendencies being fully developed; for the cold has the effect of promoting seed, and the manure is also diverted towards this primary object. The grain not being unduly hastened to maturity, becomes plump and fine in quality. It is a just observation of Mr. Hewit Davis, that the season for sowing land in good condition *begins with thv year*, and no favorable opportunity after this period should be lost in committing the seed to the ground. This is also quite borne out in the opinion which we have heard Mr. Hope, Fentonbarns, East Lothian, express. He prefers to sow barley, as well as other spring crops, by the end of February, if the soil is in a fit state and well manured. Early sown crops do not often suffer from the low temperatures that occasionally occur, and they are rendered far more certain and productive.

Scotland, however, it is under certain circumstances advantageous to delay the period of sowing barley. In some of the more elevated districts, where the soil is strong and not well adapted for grazing or for turnips, barley is generally taken after a crop of wheat. In this case the land is somewhat low in condition, and delaying the sowing till the beginning of May greatly increases the productiveness of the crop. A century ago barley was rarely sown before the month of May, as the sources of manure were then exceedingly scanty. This is still more forcibly brought out in former times in the cultivation of bere or bigg, the four-rowed barley. This variety was usually sown in the beginning of June, and was still less dependent on a supply of nitrogenous manure. Indeed, it was thought to exhaust the soil comparatively little, as it could be raised on ordinary land for many years in succession with the slightest dressing of manure.

These facts show that barley may be sown late in the season with advantage in the cooler and moisture parts of Britain. In such circumstances it can be grown with less manure, which to a certain extent acts as a compensation for the inferior quantity and quality of the produce. One of the most direct effects of this, however, is in retarding the general introduction of improved systems of farming, in which green crops occupy more attention. On the poor soils of Norfolk neither barley nor wheat can be got without turnips, whereas in moist climates very different practices may be followed with a greater measure of success; and the necessity for turnip culture not being so imperative, the crop is only slowly introduced even in those districts where the climate is best suited for its growth.

The effects of the physical or mechanical properties of soil on the growth of barley in relation to climate is in some respects different from that of wheat; these differences, however, have not a little to do with the seasons at which the barley crop admits of being sown. The stiff clay soils of Suffolk and Huntington we usually recognize as well fitted for the growth of wheat; but, through the improved methods of cultivating these soils, they have become admirably adapted for the geowth of barley. The rotation adopted—of clover, wheat, fallow, barley—permits of the soil being reduced to a fine tilth by the winter frosts. The finely pulverized mould sustains the growth of the barley crop as well as the finest turnip loams. Under these circumstances, the vegetable manuring of the clover crop acts more beneficially on the wheat which follows it than it would on the barley; indeed, this crop is much sooner injured by an excess of vegetable matter in the soil than wheat: the latter is cultivated with success in the humus soils of the Lincolnshire fens, where barley does not thrive. In moist and humid climates barley is very susceptible of vegetable matter, and where it abounds becomes gross in its habits. Its use is most advantageous on the slightest soils, as is also the case with wheat, rendering them better fitted for sustaining growth in dry weather.

As the climate increases in aridity, so must the soil improve in its physical properties, to maintain the healthy growth of the crops. A sandy soil is well known to be naturally more fertile for cereals in a moist than in a dry climate. So, on the other hand, careful tillage, having for its object the improvement of the physical properties of soils, by rendering them more retentive of moisture, is more required in dry climates. The painstaking management which the Norfolk farmer pursues in pulverizing his weakest sands for a crop of barley contrasts strikingly with that followed in moister districts. Mr. Pierson, Framlingham, Suffolk, writes, in Messrs. Raynird's 'Farming of Suffolk:' "On light soils that have been sheep-folded it is a common practice to plow three times: by this means the manure is more equally dispersed, and experience has proved that a dry summer does not injure the barley so much as it does when the land is plowed only once." Arthur Young, and other early writers on agriculture, drew attention to the careful cultivation of the light lands for barley in the eastern counties as a means of resisting the effects of drouth. In cool and moist climates plowing sheep-folded land more than once where the soil is light has never been practised as a system; nay, it is too often supposed that pulverizing light lands in the spring rather has the effect of dissipating the moisture than of rendering them more absorptive and retentive.

The necessity which the Norfolk farmer felt for having his land thoroughly comminuted for the production of spring-sown crops also paved the way for the general introduction of sowing by the drill: this implement has only slowly extended in moist climates; one reason, no doubt, being the less careful culture which the land receives, and where late sowing is followed it is of no advantage. The crop then grows rapidly and keeps the weeds in check, and the use of the hoe is less needed for this purpose. It is of more importance to have the seed distributed equally over the land when the time of sowing is delayed, as there is then less time for the crop to send its roots throughout the soil; hence wide drilling for cereals can be followed advantageously for autumn sowing, but narrower intervals are preferable as the season advances.

The influence of climate on the productive qualities of the *oat* crop is so well recognized that it will be unnecessary to dwell long upon the subject. It is a plant that requires a larger amount of moisture than either barley or wheat: the latter two become plumper and thinner in the skin when the temperature is moderately high during the ripening season: on the other hand, oats lose their plumpness under a high temperature—they become lean and light in weight.

In even moderately moist and cool climates, oats are more fluctuating in their produce on light soils than any other cereal. Requiring a considerable quantity of moisture to maintain their healthy growth, they are easily hurt during periods of drought, and are not remunerative for liberal treatment. Were it not for the difficulty of keeping such soils clean, wheat would yield nearly double the value oats would do; but oats, checking the growth of weeds in their early stages, leave the land much cleaner and more easily managed when under preparation for green crops. On the other hand, oats generally turn to good account nitrogenous manures applied on clays or deep loams; they are not so liable to suffer from over-luxuriance as barley, and are altogether a much grosser feeding plant. Soils abounding in vegetable matter yielding nitrogen afford manure to the oat crop in the best possible form.

It is generally found that the latest varieties of oats are the most productive: though this is best seen when cultivation is in a backward state. In Scotland, when the soil was poorer and in a worse condition, the harder and later varieties of oats were preferred. By their growth being extended over a longer period, they had greater powers of abstracting food both from the soil and atmosphere. The potato oat is no doubt a productive variety, but it requires to be early sown and liberally manured to yield well.

LAND DRAINAGE.

BY JOHN H. KLIPPART.

[NOTE.—The annual Report of 1860, contained an essay by the author of the following paper, upon *Practical Drainage*, and its publication elicited a great many letters of inquiry as to the rules laid down and the advice given in that article, and I have, therefore, deemed it proper to make one full and sufficient reply to all, by giving at length the rational *theory of drainage*, in connection with its history, from the earliest date.]

INTRODUCTORY.

DEFINITION.

Drainage of land, or farm drainage, may be defined as being a process by which wet and unhealthy soils may be rendered arable and healthy, as well as to remove excessive moisture in lands not generally considered too wet.

The word *drainage*, when used in an isolated sense, means drying up, running off of stagnant water. It is also applied to a series of works which are undertaken in order to improve the sanitary condition of whole sections of country or a large city, to change the course of a river, and to protect its cultivated banks against floods. General drainage is that which constitutes a whole system of great works stretching over entire valleys, and regulate all its running water; *agricultural drainage* refers to fields only.

Drainage, as practiced at the present time, is an improvement, or a transformation of the old system for drying up moist soils by means of trenches or ditches, for the discharge of water, which was known and resorted to everywhere in former times.

It is, nevertheless, true, that the transition or change from trenches or uncovered ditches filled with stones, to the new mode of draining, was a slow process, which may explain why many persons, when they learn of the "new" drainage, will exclaim: "But this is not new, that was practiced by our fathers." These persons are right. But, as far as arts and science are concerned, all is becoming singularly perfect in our days, so that we do not always recognize the starting point. This was the case with the new system of drainage which conducts the excess of water from tillable lands through earthern pipes of moderate length, placed under ground at a depth of from three to four feet.

But how can the water be led off through such earthen pipes? we often have been asked. In 1852, Mr. Daniol, a skillful agriculturist, at Clermont Ferrant, in France, wrote to Mons. Barras, editor of an agricultural journal:

"New words used by scientific writers often cause embarrassment to their readers. When the *Journal of Practical Agriculture* indicates *drainage* as a potent system of rendering wet lands arable; when you praised the advantages which are obtained in England and Belgium, you excited my curiosity and highly engrossed my attention. But having discovered that drainage is the very thing we resort to from father to son, and which we name like Oliver de Serres, *subterranean passages*, I experienced a sense of satisfaction and said to myselt, is that all? what next?

"Next, you indicate, for the purpose, earthen pipes as the most efficient and economic implement! I vainly endeavored to perceive how water in excess at the surface could penetrate into these pipes. Doubtless, thought I, if this water springs up at a single place and for want of exit spreads over the whole field, it is an easy matter to collect it through waterworks introduced into the pipes and let it run off at a lower spot. But otherwise, if you have several springs to contend with; if the excess of water after the normal saturation of the soil is produced by superabundant rains during several years, how, once more, will the numerous little sources penetrate and find their way through the surface of, and into the pipes? I will suppose that the ends of the pipes are only contiguous, that at first cracks will admit water, but earth will, in course of time, fill up the joints; in both cases the work will be expensive and useless."

Such doubts expressed by a very learned agriculturist, prove that much has yet to be said in order to convince our agriculturists of the utility of drainage, and to render its effects conspicuous to them. On the other hand, numberless questions are addressed to us about the manner of making pipes, the quality of clay, the kind of machines, baking or burning, cost, results to be expected, and so forth. The work for laying the drains does not appear, in general, difficult to comprehend and execute; the numerous writings on the subject scattered through the agricultural and other journals, have enlightened the majority of cultivators. But many a point relating to the execution, remains unexplained; we, therefore, have deemed it proper to go over the whole subject without neglecting that which practical men and publications have heretofore elucidated.

Notwithstanding the origin of drainage may often have been related, a sketch of its history and progress may not be out of place here. The importance of drainage is the sole point of the subject, which really should *not* require any further discussion; it was prominently brought forward by Mr. Martinelli, of Nerac (France), at a county fair, in a few words, which we translate from the *Journal of Practical Agriculture*, viz:

"Look at this flower pot. What is the hole at the bottom for? I ask you, because there is a complete agricultural revolution in that hole. It affords a renovation of water by a timely flow. And why must water be renovated? Because it gives either life or death: life, when it merely traverses a layer of earth which retains the fecundity with which water is pregnant, and beside dissolves nutriments conveyed to the plant; death, when it remains in the pot, because it will soon be corrupted, will cause the roots to become diseased and prevent admittance to new water."

The drainage of tillable land is a small hole at the bottom, just like that of the flower pot.

HISTORY OF DRAINAGE AMONG THE ANCIENTS.

The new system of drainage emphatically consists in the use of covered causeways; we, therefore, will devote no space nor time to the discussion of open tranches as a means of removing superflous water and rendering lands arable, subject to this condition. The idea of redeeming from waste and of making available for cultivation the surface occupied by gaping ditches, may be traced back to the earliest ages. The Romans were acquainted with a process of draining lands derived, no doubt, from antecedent civilization. Nevertheless, among agricultural writers, Columella is the first who speaks of underground causeways; he lived in the reigns of Augustus and Tiberius. Cato, Varro, and Virgil, advocate open trenches only. Here is Columella's text:*

"When the soil is moist, ditches are to be dug out in order to dry it up and let the water run off. We know of two kinds of ditches: those which are hidden and those which are wide and open; as to the hidden ditches, one will dig out trenches of three feet in depth, which shall be half filled with small pebbles or pure gravel, and then the whole will be covered with the earth which was taken out from the trench. Should there be neither stones nor gravel, then fascines formed of branches tied together, of the same shape and capacity of the trench, may be placed into it so as to fill up the cavity. When the fascines have been sunk into the bottom of the canal, they must be covered with leaves of cypress, pine, or any other tree, then shall be superadded the earth extracted from the trench, and the whole will strongly be compressed. At both ends must be placed in the form of a buttress (as it is done for small bridges), two large stones surmounted with a third one, in order to consolidate the sides of the ditch and favor the fall and exit of the water."

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* Lib. II., cap. 2.

Palladius, who came long after Columella, thus describes the underground causeways:*

"When the lands are wet, they will be dried up by digging trenches everywhere. Every one knows how to make open trenches, but here is the way to make hidden trenches: One digs out across the field ditches of three feet in depth, which are to be half filled with small stones or gravel; after which they are filled up with the earth from the digging and leveled. But the ends of those causeways must lead in declivity unto an open ditch whither the water will run without carrying away the earth of the field. Should there be no stones, one will lay at the bottom of the ditch, fascines, straw, or briars of any kind whatever."

Thus, drainage, by means of underground causeways through which the flow of water is secured by means of permeable materials, like stones or branches, is an invention that no modern has any right to claim; though drainage, such as described by Columella and Palladius, has long been used at numerous places in France. England endeavored to ascribe to Captain Walter Bligh the invention of deep trenches. Walter Bligh's only merit is the reproduction of the precepts applied before him, and perfectly elucidated by the elder French writer on agriculture, Oliver de Serres.

Even in Columella's time, the importance was fully appreciated of making the drains with sloping sides and narrow bottom. From this forward there was a slight step only to actual and thorough drainage. There is abundant evidence to prove that the ancient Romans used clay pipe as conduits for water everywhere where they established themselves; that even in lower Austria, Saxony, and other countries, a similar system of conduit by clay pipes obtained, evidence of which is yet to be found in some of the cultivated fields; there appears to be presumptive evidence, at least, that drainage by clay pipes or tiles was a Roman invention.

UNDERGROUND CAUSEWAYS AMONG THE GREEKS.

We said that the Romans were acquainted with a mode of draining lands through trenches covered and filled with stone. We did not derive the origin of it from more ancient civilization, because we do not consider the subterranean canals built by the Greeks to remove enormous reservoirs of water, which might have caused extensive floods, as mere agricultural drains. M. Jaubert de Passa, in his *Researches on Irrigation among Ancient Nations*,† speaks thus:

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* Lib. VI., cap. 3.

† Vol. IV;, p. 36.

"Was the mysterious outlet of the lake Stymphalide toward the coast Argos,* the work of man or caprice of nature? It is known that the water of the lake did run into two abysses situated at the extremity of the valley; when these openings were obstructed, the water covered a space of over 400 stadii, or about thirty miles. The river Stymphale, which the inhabitants of Argolida named *Erasinus*, was not the only one of which the course was partly under ground. The Alpheus, after having several times disappeared from the earth's surface, plunged int sea, according to traditions,† in order to go into Sicily, where it mingled its water with the spring of Arethusa. The plain of Orchomenes became marshy as soon as the subterranean ducts, regular outlet of the water from Mount Trachys, failed to be cleansed. The plain of Caphyes was sometimes overflown by the water of the Orchomenes. As a permanent protection for the country and the city, the magistrates of Caphyes caused the establishment of a causeway along the flowing canal, behind which water from various sources formed the river below.‡

"The plain of Phenea, next to the others, remained for a long time overflown. At a remote but unknown epoch, an earthquake, according to some, a benficent prince, according to others, opened two abysses or *zerethra*, which let out the water and made the land healthy;‖ finally, the valley of Artemisium, situate near Mantinea, and named *Argos*, on account of its sterility, became marshy as often as water obstructed the gulf which was its outlet. This subterranean duct extended as far as Genethlium, a city built at the head of the lake Dine."§

Certainly, these immense underground works of the Greeks must have had the drainage of extensive districts for their object, but they were undertaken as a public hygiene, and not to enhance the fertility of arable lands. Agricultural drainage has this last as its special object; but this cannot always be attained without some general work for the drainage of a whole valley.

We read in Walter Bligh's book, third edition, printed in 1652:*

"As to the drain trench, thou will make it deep enough so that it may reach at the bottom cold, oozing, stagnant water. Say one yard, or four feet, if thou wishest for satisfactory drain. And furthermore, having come to the layer whereat rests the oozing spring, sink further down about the depth of an iron shovel, no matter how deep thou art already, if thou wilt drain thy land throughout. . . . . But as to ordinary trenches, which are often dug out one or two feet, I say that it is madness and lost work, and I will spare the reader wherewithal."

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* Strabo VI., cap. 3 § 9, and VIII., cap. 9 § 4.

† Pausania VIII., 44, 54.

‡ Pausanias VIII., p. 23.

§ Pausania VIII., p. 7, 20, 21, 25.

‖ Pausanias VIII., p. 14, 19.

¶ "The English Improver Improved, or the Survey of Husbandry Surveyed."

These injunctions certainly are pertinent, and may serve as a guide even at this day; but one ought not to conclude from them, as some modern writers did, that, as no French agricultural author treated the subject as a specialty, and with sufficient details, all the merit of the introduction of open trenches belongs to England. Oliver de Serres, who lived before Walter Bligh, and whose *Theatre of Agriculture* was printed in 1600, gives a very complete description of the underground causeways, strongly recommending the use of them. Not only does he consider the single trench, as did Columella, but he goes further; he treats of many together, he is careful to describe the main ditch as also covered, and every precaution to be taken in order to secure effective drains. As Oliver de Serres was altogether neglected in the history of drainage, and his well-defined ideas having been attributed to divers authors, we will give, *in extenso*, a passage from the book of this great French writer on agriculture:*

"To discharge noxious water, the usual way is to open ditches, especially through plains and low places, these ditches becoming inclosures for the land. Let the land then be dug around, and give the ditches proper width and depth, to fulfill both objects. They must be cleansed every second year, some time previous to sowing lands, on which shall be cast this detritus from the trenches, to be used as so much manure. But, should it happen that the field be full of springs, or underground oozing sources, external ditches are no longer sufficient; then will be required another and more peculiar remedy, as will be shown, in order to rid inner land of this incommodiousness. Inasmuch as the evil of too much water exceeds in destructiveness, both that of shadow and of stones, to mend the former will require greater labor than to correct the latter; of this, finally, the profit as a recompense comes out greater than from any other reparation that can be given to the land, so fruitful is that which relieves it from water; because thereby not only are wet lands improved, but pools and swamps are converted into exquisite plow fields.

"The examples serve us as good masters to do good husbandry. Where is the farmer beholding the beautiful wheat raised on drained swamps, that does not desire, in emulation, to imitate such profitable husbandry? The cause of this comes from a superabundance of water, which prevented land from being worked for several years; at the end of which, finding itself reposed, and thereby to have acquired fertility, returns it admirably and with profit. And how much more hope you will have from this, which by the ancient subjection to the springs, was never able to produce, which you will find pregnant with fertility! Beside the income, there is no doubt that from noxious water spread here and there on your land, when collected in one place, you could make a fountain spring according to places, so great and with such abundance of water, that it will suffice for the irrigation of meadows, which you will make on account of that, below the drained pieces, and indeed for erecting mills there, should the ground and other circumstances requisite be favorable.

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* Theatre d'Agriculture, Second Lieu, t. 1, p. 97.

"The ground you desire to drain must have a declivity, either small or great, without which the water could not run off. This being pre-supposed, a large ditch must be dug from one end to the other, always beginning at the lowest spot; into that trench, many others, but smaller, may be joined on both sides, in order to discharge the water flowing from all parts of the ground. By this means, each supplying its portion, the large ditch collecting, the whole will be discharged. The large trench is, on that account, called *mother trench*, and the whole together, '*hen's paw*,' from the figure of that animal's foot, whose claws stretch in toward its trunk. The extent and surface of the land give form to the ditches, because it is fit to make them longer and wider in proportion as your land is extensive and flat, which you drain; and on the other hand, they are required shorter and narrower, if it be small and sloping; because, within a narrow compass, generally, not so much water is collected as in a large one, and as much, nay, more of it will pour out of a narrow ditch with great declivity than a wide, gently sloping trench. *About the depth of the ditches, it is not thus, for, in whatever part you dig, you must go about four feet deep, in order to cut off the source of the springs, which is the special aim of this business.* According to the nature of the place, must the trenches be disposed.

"Should there be a low vale, with high ground on both sides, the *mother* must be dug in the middle and lower spot, lengthwise, as already said, into which must fall the other ditches from both sides. But having to drain only one hillside, in that quarter there will be some small ditches running into the mother trench, and disposed as will seem fit for the best of the work and premises; as also the length of all trenches is subordinate to the plan which dictates the order of them, according to the surface and site. Having the plan, reasonable fall and extent, a proper width will also be required for the small ditches; the latter should be three feet, and the mother five feet deep; by means of this guide, your intention will be fulfilled. And to avoid any mistake, let there be as many ditches, so long, so wide, without fear of excess on this score, that no source of spring, or small fountain, be overlooked, in order to drain your land well, by the general gathering of its waters.

"*Those ditches, large or small, must be half filled with minute stones, and the other half with the earth previously dug out, and leveled at the top, so that* *no trace of it even will appear, for the commodiousness of tillage*, which should be executed very well, the plow finding depth enough of earth before reaching the stones, through which water will freely pass and flow out at the spot designed for it, leaving the surface land free of all noxious moisture, and fit to bring forth all kinds of cereals.

"A similar work must be applied to all estates, vineyards, meadows, orchards, and others which produce no fruit on account of too much moisture. If you have on the spot none but large, flat stones for supplying your trenches, before using them you must break them to suit this kind of service, and they should be placed into the ditch straight (upright) and not flat, fixing them beside so skilfully that they will not be too tight to prevent the flow of water. To have this business well done, begin right, that is, artistically and with order; through ease and without confusion, you will succeed very well. It will be easy to draw all your ditches, by cautiously observing the places through which they are to pass; then you begin to dig them out at the lowest spots, casting the earth all on one side of the trench, leaving the other side free, to bring thither easily the stones, which must be thrown in immediately, for fear that, by delaying, the trench might cave in by effect of the wind, trampling of beasts, or any other accident.

"Thus your undertaking shall be completed at one end, as soon as commenced, in prosecuting it until you reach the highest spot of the field. In the meanwhile the water will take its course as soon as the opening of its way has been performed, which could not take place should you begin the work at the highest spot, for want of issue allowed to water; even this would disturb the digging by discharging into it. You will mind, also, that the issues of water be well managed, that they do not choke up afterward, because for want of issue water might retrograde and render your labor useless. This will be obviated by stones and mortar, put up by a master hand, so as to last long, especially at the spot where the main or mother trench lets out the water. You are finally advised that the extremities and ends of your small ditches, at their highest parts, need not to be as wide as in low places, not being compelled to collect there so much water as below; this, nevertheless, remains at your discretion, because they cannot be too wide in any place in order to receive not only water springing from the bottom, but also that from the rain above, which shall not be overlooked.

"This work produces several advantages, since at the same time an excess of water and stones are removed from the ground, and that water is made serviceable for meadows, mills, even for fountains, the qualities of it being considered, for which usefulness it is rendered commendable; also, that improvement ought to be prosecuted by all husbandmen. Beside, nothing is lost in that performance; because the trenches being filled up to their superficies, all the land is exposed and fit for tillage, even to an inch; that cannot be said when trenches are left open, which occupy much ground, and, in contradistinction to the others, are liable to need repairs from time to time.

"Should stone for replenishing ditches fail on the spot, do not have them brought from afar, at great expense, but instead use straw, which you may employ in this wise:

"The rye straw, on account of its strength, can be used, and this failing, replace it with wheat straw. *You will make with it a floor in the ditch, in order, being suspended, to cause an empty space below for the passage of the water, and above this floor you will put two feet of earth.* The empty space should be one foot high, the thickness of the floor another foot, and the two of earth will make four feet depth of the ditch. These ditches must be only two feet and a half wide, narrower by six inches than others, for the subjection of straw, for fear of choking up the empty space below, by caving in on account of its weight the earth put on the top. The mother trench, recipient of water, must not be wider than the others, considering the difficulties of the straw; but this may be overcome by using two mother trenches, or only one so deep that it will suffice to collect all the water directed to it. The straw ought to be arranged into bundles one foot thick and two and a half long, tied up even at three equidistant places.

"In order to lay these bundles as they ought to be, you will make the ditch narrower at the bottom than at the top, not in declivity or slope, but perpendicular, contracting into square at the place whereon the floor is to be laid, to rest firm and secure as upon walls. The contraction at each side must be six inches; thus the lowest place of the ditch will be one foot and a half, and two and six inches at the widest part, which is the top. Should you suspect your ditches and drains of being too small, the remedy is not to widen them, considering the difficulties of the straw, but it consists in their number: for, as already said, you cannot have too many of them, and you never will remove too much water from a swamp or marshy ground. Thus you must be careful to dig a sufficient number of them and so well disposed, that they may discharge the ones upon the others by branches connecting them, in order to conduct all the water of the field into the mother trench and empty it at the proper place.

"Straw, thus employed, will last a long time; for it is admitted that, being inclosed within the earth and without the effects of air, straw remains sound over a hundred years. I am a witness that some sound straw was found entire in the midst of an old, ruined house, and the wall appeared to be the work of former ages. Therefore, use it without scruple, with the understanding that if it should rot at the end of a hundred years, those who will come then, may change it if they have a mind to."

On the subject of the straw to replenish trenches, as indicated by Oliver de Serres, Victor Yvart, in a remark added to the edition of the works of the illustrious writer, and published by the Agricultural Society at Paris, A. D. 1804, says:

"It might prove safe and cheap, in the above case, to use faggots made of small alder tree branches, which keep well in water, and for want of them, other branches, which, placed at the botton allow, through their interstices, free exit to water, and afford all the advantages of straw, without its drawbacks."

From the above important quotation, it follows that the invention of underground causeways for draining tillable lands can not be claimed by an English author, even a Walter Bligh or an Elkington. The latter was a Warwickshire farmer, gifted with an observing mind and great perseverance, who, toward the end of the last century, drained wet lands and was so successful as to attract the attention of the parliament and to obtain very many recompenses. But his method is not much different from Oliver de Serres' stone system. Elkington's process does not admit of mother trenches, in order to lead the water out of the fields and appropriate it for divers uses.

There are three manners of disposing of the water:

1. Water sinks into permeable, inferior layers, through a well filled with stones.
2. Should the well require a depth of more than thirteen feet, its office is supplied by boring a hole with a rod, until it reaches a porous strata.
3. Water springs up, like in artesian wells, either by means of shafts or wells conveniently situated, and then removed through discharging pipes.

This method named Elkington's, consisting in the double contrivance of wells and underground ditches combined, requires special dispositions, according to the configuration of the ground; it combines, also, drains with shafts and artesian wells.

DRAIN PIPES USED IN FRANCE, A. D. 1620.

The invention of drainage pipes has always been conceded to England. Should the statement contained in the following letter prove to be beyond controversy, we ought to say, the English have shown the importance of using underground pipes to drain the land, but this invention is of French origin:

"SIR: I read in the *Journal of Practical Agriculture* your essay on drainage scarcely begun, and already full of interest; it foretells deep attraction when it treats of its influence on crops, manures, etc.

"In the conclusions of your chapter on the history of drainage, a contrivance known to antiquity, you show three degrees in the periods of progress through which it came to us.

"The first, its origin, perhaps, was the practice of it among the Romans, as related by Columella, and Palladius.

"The second, in which our priority over England is established, thanks to Oliver de Serres.

"The third, in which you abandon the whole conquest to the English, because they substituted tiles and pipes for other materials.

"The latter period is indeed capital; heretofore it was darkness; now it is a science. The last improvement elevated drainage from the rank of an agricultural drugery to the sphere of industry; caused men of genius to cluster around; attracted the attention of men of the world and the powerful support of an enlightened, partial government.

"This lucky improvement, this starting point, I may say, shall not be denied by me to the English; it would be in bad taste to claim glory for an invention, when we failed to make it fruitful. I will only state that the same idea of this improvement was realized in 1620, about the time when Oliver de Serres published his works.

"Within the town of Maubeuge, in my own neighborhood, was a convent of monks; the epoch of its erection could easily be ascertained; its chapel is still a pure specimen of gothic style. The convent did not escape the republic of 1793, and the aspect and inmates have changed, but its wide and splendid garden was respected. Was it on account of its reputation? It is well known that, from immemorial time, it was renowned for its fertility, the beauty and earliness of its fruit and for the friability of its soil.

"The estate was sold, and last year the premises underwent repairs: the prolific garden was turned into pleasure ground, park with fountains, driving causeways, artificial elevations of ground, and so forth. This overturning disclosed the secret of its marvelous reputation.

"Two complete and regular pipe drains extended throughout the whole garden, at the depth of four feet.

"One of the drains had all its pipes radiating to a sinking well situate in a central position; the other was made of pipes all parallel, ending at a collecting pipe which discharged into a cellar.

"The owner had the kindness to give me two pipes as specimens of curiosity; they are about ten inches long and four inches in diameter; one end expands into a funnel-shape, the other tapers into a cone; they are made of an argilo-silicious composition like most of our earthenware, which is very hard and becomes very much glazed in burning, thereby becoming unalterable; all were found well preserved; they were evidently made by hand and lathe.

"When was the drain constructed? No particular data is given. MSS. left by the monks might solve the question; at any rate, some tombs, placed over the drain in 1620, show it to be anterior; here, then, is an ancient drainage, made with masterly hands three hundred and forty years ago, which, in its dimensions, system, and materials, is much like those of the present day.

"To vouch for the truthfulness of the facts, it ramains for me to state that the particulars were given to me by Hon. Marchant, senator, owner of the estate, and by his son-in-law, my brother, a distinguished agriculturist, who was present when the excavations were made.

"G. HAMOIR, *Member of the Ag. Soc.*"

Having shown, at considerable length, the origin of drainage in France, it may be well to devote a few pages to the introduction of this improvement into England.

The first work published on the subject by an English author, Capt. Walter Bligh, already referred to. His work, the ENGLISH IMPROVER IMPROVED, or, *The Survey of Husbandrg Surveyed*, was published in 1650. The principles of drainage advocated by Capt. Bligh, are thus expressed by Josiah Parkes, an eminent practical drainer in England, in the 7th vol. of the *Journal of the Royal Agricultural Society:*

"In his instructions for forming the flooding and draining trenches of water-meadows, the author says of the latter: 'And for thy drayning trench, it must be made so deep, that it goe to the bottom of the cold spewing moyst water, that feeds the flagg and the rush; for the widenesse of it, use thine own liberty, but be sure to make it so wide as thou mayest goe to the bottom of it, which must be so low as any moysture lyeth, which mysture usually lyeth under the over and second swarth of the earth, in some gravel or sand, or else, where some greater stones are mixt with clay, under which thou must goe half one spade's graft deep at least. Yea, suppose this corruption that feeds and nourisheth the rush or flagg, should lie a yard or four-foot deepe; to the bottom of it thou must goe, if ever thou wilt drayn it to purpose, or make the utmost advantage of either floating or drayning, without which the water can not have its kindly operation; for though the water fatten naturally, yet still this coldnesse and moysture lies gnawing within, and not being taken clean away, it eates out what the water fattens; and so the goodnesse of the water is, as it were, riddled, screened, and strained out into the land, leaving the richnesse and the leannesse sliding away from it.' In another place, he replies to the objectors of floating, that it will breed the rush, the flagg, and mare-blab; 'only make thy drayning-trenches deep enough, and not too far off thy floating course, and I'le warrant it they drayn away that under moysture, fylth, and venom as aforesaid, that it maintains them; and then believe me, or deny Scripture, which I hope thou doust not, as Bildad said unto Job, 'Can the rush grow without mire, or the flagg without water?' Job viii, 11. That interrogation plainly showes that the rush can not grow, the water being taken from the root; for is it not the moystenesse upon the surface of the land, for then every shower should increase the rush, but it is that which lyeth at the root, which, drayned away at the bottom, leaves it naked and barren of relief.'

"The author frequently returns to this charge, explaining over and over again, the necessity of removing what we call bottom-water, and which he well designates as 'filth and venom.'

"In the course of my operations as a drainer, I have met with, or heard of so many instances of swamp-drainage, executed precisely according to the plans of this author, and sometimes in a superior manner—the conduits being formed of walling stone, at a period long antecedent to the memory of the living—that I am disposed to consider the practice of deep drainage to have originated with Capt. Bligh, and to have been preserved by imitators in various parts of the country; since a book, which passed through three editions in the time of the Commonwealth, must necessarily have had an extensive circulation, and enjoyed a high renown. Several complimentary autograph verses, written by some imitators and admirers of the ingenious Bligh, are bound up with the volume. I find, also, not unfrequently, very ancient deep drains in arable fields, and some of them still in good condition; and in a case or two, I have met with several ancient drains six feet deep, placed parallel with each other, but at so great a distance asunder, as not to have commanded a perfect drainage of the intermediate space. The author from whom I have so largely quoted, is the earliest known to me, who has had the sagacity to distinguish between the transient effect of rain, and the constant action of stagnant bottom-water in maintaining land in a wet condition."

The next important step in the progress of drainage in England, was by Joseph Elkington, an illiterate Warwickshire Farmer; but a man who undoubtedly possessed more than ordinary ability, if not absolute genius. His discovery and subsequent practice created such a sensation throughout England and Scotland, but more especially in the agricultural circles, that at the solicitation of the Board of Agriculture, Parliament in 1795, voted him £1,000, as a reward for his discovery in the drainage of land.

Elkington being incapable of writing out his discovery and system of drainage, so that others might be benefited by such a work, the Board of Agriculture appointed a Mr. John Johnstone to visit Elkington's principal works, and study them carefully, and record it for the benefit of others. Mr. Johnstone accordingly studied the Elkington system of drainage, and wrote a treatise on it. Recent writers charge Mr. Johnstone with giving his own opinions in many instances, rather than those of Mr. Elkington.

He gives the following statement of Elkington's discovery:

"In the year 1763, Elkington was left by his father in the possession of a farm called Prince-Thorp, in the parish of Stretton-upon-Dunsmore, and county of Warwick. The soil of this farm was so poor, and, in many places, so extremely wet, that it was the cause of rotting several hundreds of his sheep, which first induced him, if possible, to drain it. This he begun to do, in 1764, in a field of wet clay soil, rendered almost a swamp, or *shaking* bog, by the springs which issued from an adjoining bank of gravel and sand, and overflowed the surface of the ground below. To drain this field, which was of considerable extent, he cut a trench about four or five feet deep, a little below the upper side of the bog, where the wetness began to make its appearance; and, after proceeding with it in this direction and at this depth, he found it did not reach the *principal body of subjacent water* from which the evil arose. On perceiving this, he was at a loss how to proceed, when one of his servants came to the field with an *iron crow*, or bar, for the purpose of making holes for fixing sheep hurdles in an adjoining part of the farm, as represented on the plan. Having a suspicion that his drain was not deep enough, and desirous to know what strata lay under it, he took the iron bar, and having forced it down about four feet below the bottom of the trench, on pulling it out, to his astonishment, a great quantity of water burst up through the hole he had thus made, and ran along the drain. This led him to the knowledge, that wetness may be often produced by water confined farther below the surface of the ground, than it was possible for the usual depth of drains to reach, and that an *auger* would be a useful instrument to apply in such cases. Thus, chance was the parent of this discovery, as she oftens is of other useful arts; and fortunate it is for society, when such accidents happen to those who have sense and judgment to avail themselves of hints thus fortuitously given. In this manner he soon accomplished the drainage of his whole farm, and rendered it so perfectly dry and sound, that none of his flock was ever after affected with disease.

"By the success of this experiment, Mr. Elkington's fame, as a drainer, was quickly and widely extended; and after having successfully drained several farms in his neighborhood, he was, at last, very generally employed for that purpose, in various parts of the kingdom, till about thirty years ago, when the country had the melancholy cause to regret his loss. From his long practice and experience, he became so successful in the works he undertook, and so skillful in judging of the internal strata of the earth, and the nature of springs, that, with remarkable precision, he could ascertain where to find water, and trace the course of springs that made no appearance on the surface of the ground. During his practice of more than thirty years, he drained in various parts of England, particularly in the midland counties, many thousand acres of land, which, from being originally of little or no value, soon became as useful as any in the kingdom, by producing the most valuable kinds of grain, and feeding the best and healthiest species of stock.

"Many have erroneously entertained an idea that Elkington's skill lay solely in applying the auger for the *tapping of springs*, without attaching any merit to his method of conducting the drains. The accidental circumstance above stated, gave him the first notion of using an auger, and directed his attention to the profession and practice of draining, in the course of which he made various useful discoveries, as will be afterward explained. With regard to the use of the auger, though there is every reason to believe that he was led to employ that instrument from the circumstance already stated, and did not derive it from any other source of intelligence, yet there is no doubt that others might have hit upon the same idea without being indebted for it to him. It has happened, that, in attempts to discover mines by boring, springs have been tapped, and ground thereby drained, either by letting the water down, or by giving it vent to the surface; and that the auger has been likewise used in bringing up water in wells, to save the expense of deeper digging; but that it had been *used in draining land, before Mr. Elkington made that discovery, no one has ventured to assert.*"

Johnstone sums up this system as follows:

"Draining, according to Elkington's principles, depends chiefly upon three things:

"1. Upon discovering the main spring or source of the evil.

"2. Upon taking the subterraneous bearings; and,

"3. By making use of the auger to reach and *tap* the springs, when the depth of the drain is not sufficient for that purpose.

"The first thing, therefore, to be observed is, by examining the adjoining high grounds, to discover what strata they are composed of; and then to ascertain, as nearly as possible, the inclination of these strata, and their connection with the ground to be drained, and thereby to judge at what place the level of the spring comes nearest to where the water can be cut off, and most readily discharged. The surest way of ascertaining the lay or inclination of the different strata, is, by examining the bed of the nearest streams, and the edges of the banks that are cut through by the water, and any pits, wells, or quarries that may be in the neighborhood. After the *main spring* has been thus discovered, the next thing is to ascertain a line on the same level, to one or both sides of it, in which the drain may be conducted, which is one of the most important parts of the operation, and one on which the art of draining in a scientific manner essentially depends.

"Lastly, the use of the auger, which, in many cases, is the *sine qua non* of the business, is to reach and tap the spring when the depth of the drain does not reach it; where the level of the outlet will not admit of its being cut to a greater depth; and where the expense of such cutting would be great, and the execution of it difficult.

"According to these principles, this system of draining has been attended with extraordinary consequences, not only in laying the land dry in the vicinity of the drain, but also springs, wells, and wet ground, at a considerable distance, with which there was no apparent connection."

About the year 1810, it was deemed advisable to change the former system of draining. Flat and hollow tiles were at first adopted. Tile drainage appears to have been put in practice, for the first time, at Netherby, in Northumberland, upon the estate of Sir James Graham. "A tile and sole, with a few inches of stone, is the *ne plus ultra* of draining:" thus reads the *Journal of the Society of Agriculture of England*, vol. II, p. 293. It seems that for a period of thirty years, there appeared no possibility of improving on the method invented in 1810.

But it remained for the agriculturists of the nineteenth century to establish a system of drainage in accordance with scientific principles—to make it more general in its application; to provide apparatus and machinery for the more precise and uniform construction of the drains, as well as the tile; and the entire art has been so much improved that all previous experiments and systems vanish into almost nothingness in comparison.

The ancient mode of draining, successful as it may have been, yet inefficient as it certainly was, subjected those who practiced it to many inconveniences, while itself was subject to many liabilities from which the modern or English system of tile draining is exempt. Not only was that system attended with many inconveniences in construction, for want of proper materials, but even when constructed was liable to become deranged in a comparatively short period of time, and to repair them was attended with not only great expenditure, but great inconvenience and labor. Beside, these drains, made of wood, stone, etc., served for the single purpose of draining the springs and stagnant surface water only, while the modern ones, made of tile, not only serve this same purpose, but also accomplish some other advantageous results.

It soon became manifest that these wooden and stone drains were sadly deficient in permanency, and great pains were taken to substitute something better. It was somewhat of an improvement when the plan was adopted of digging a canal or ditch, and covering the bottom with brick, and then placing on these brick, to the thickness of a foot or more, large-sized pebbles or brickbats. These drains proved more durable and less liable to become deranged than the previous ones, and while they drained a given quantity of water in less time, they accomplished that one object only.

This system was in turn abandoned, and a wooden pipe, or boards forming a kind of covered triangular trough, was substituted. When these troughs were fitted in the bottom of the drain, the drain itself was then closed with turf, sod or earth. But this system was found to be very expensive, and accomplished the one object only, viz: draining the surface water and the spring water, and this very imperfectly.

Another great error was committed with this system, namely, the ditches were made so shallow that even when plowing with their shallow plows, the conduit was disturbed. The result was that when the winters were severe, the drains were frozen up, and were, in consequence, not only worthless, but an actual damage, because the soil underwent all the phenomena that it does in winter—killing wheat; and it was late in the spring before they were in a serviceable condition. Hence, at the season when they should have been of the utmost importance, they were entirely useless, because at that season there is not only the most water in the soil, but it is also a period when the water produces the most injurious results to the growing plants.

Mr. Baxter, an Englishman, was perhaps the first one to indicate the disadvantages arising from shallow drains. He describes the result as follows:

"In the year 1819, I drained an eight acre field according to the old system. The pipes were laid from twenty to twenty-four inches beneath the surface, and twenty-eight feet apart. I soon became convinced that very little benefit would accrue from this system. The crops were no better than before the piece was drained—the tilth no better or easier, in spite of the best manures which I could procure. These drains were filled with stone, and covered with turf; but, being compelled to bring the stone some distance, it made the drains very expensive. In 1832 I redrained the same field according to the new system; that is, I made the drains three feet deep at parallel distances of thirty-two feet. The advantages of this system were at once apparent. The soil was sufficiently dry for purposes of cultivation much sooner than that not underdrained; the water furrows disappeared, and with them, the expense of keeping the field clean after seeding. No more manures of any kind were applied, and yet the product was fully one-third more than previous to underdraining. Since I have commenced deep or thorough draining, all my crops yield fully one-third more. By deep draining, the water can at once flow unhindered from the field, and the soil is consequently in a condition to be worked at a much earlier date after a rain than that which is not underdrained. A given underdrained field will sustain more cattle in a good condition than one which has not been so treated. Then, the crop, too, will ripen earlier, and the labor, in clay soil, is lightened fully one-fifth for cattle or horses, while the soil itself is rendered in much better condition. The climate even is improved everywhere, where deep draining is practiced. It is the most effective means of radically removing miasma that can be introduced."

The great advantages consequent upon deep draining were then made manifest by actual experiment twenty-five years ago. About the same time, another very important invention was introduced, namely, the clay pipe, or draining tiles. The credit of this most important discovery is due to Mr. Smith, of Deanston, in Scotland. A distinguished mechanic and director of a cotton factory, Mr. Smith, wondering at the infertility of a piece of ground contiguous to that factory, after a minute observation, came to the conclusion that an excess of moisture was the cause of it, and without any knowledge of what had either been written or done by former agriculturists, it occurred to him that covered drains would answer an excellent purpose to drain tillable lands. His success was great, and much talked of in the neighborhood. In 1833, he published a pamphlet under the title of *Smith's Remarks on thorough Draining;* and although he was not the first inventor of this method, he rendered to England and Scotland the service of introducing his method of drainage, which greatly increased the fertility of British lands. We must acknowledge, in honor to that country, that land owners and the government acted in this case with more promptitude than is usual with them. Even Sir Robert Peel, in 1840, had part of his estate at Drayton, Staffordshire, drained by Mr. Smith.

This new art of draining swept like a wildfire over Great Britain, and drainage soon became more and more general in England and Scotland. The grest importance of this system of draining was not only acknowledged and advocated by the agriculturists of England, but the government gave the most substantial testimonials of its confidence in the system as an augmenter of products. A fund of two million pounds sterling, equal to ten millions of dollars, was appropriated as a fund to be loaned to farmers, to be expended in drainage—six and a half per cent. of the loan to be annually refunded, but at the expiration of twenty-two years, the entire fund to be extinguished.

Not only landlords drained their lands, but the tenants even, when their lease expired at the end of six years, drained the land they cultivated with advantage and profit to themselves. In consequence of the great advantages arising from drainage in England, a law was enacted regulating the amount to be allowed tenants for draining the landlord's farm, also a law fixing the increased value of farms which are underdrained, for purposes of hypothecation, etc.

Tiles were at first made by hand. English inventive genius was not long in forwarding this industry. As drainage spread, machines came in demand to supersede manual labor. The first one, turning out flat and hollow tiles at once, was made by Mr. Irving, during the year 1842.* Immediately after this, the Marquis of Tweeddale, Mr. Ransome, then Mr. Etheredge, invented other machinery for the same purpose.† But, to manufacture subterranean pipes in two pieces was evidently useless complication. Mr. John Read was then happily inspired with the idea of substituting cylindrical pipes for tiles. Therefore, this manufacturer added to the ancient process of drainage, the last improvement which it has attained. The first machinery of this kind was exhibited in 1843, at the Derby Agricultural Fair. It won premiums of silver medals, and was the object of minute and encomiastic descriptions by Josiah Parks, who was struck with its importance. Since that time, every year ushers in new improvements on its construction.

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* Journal of the Royal Society of Agriculture, Vol. IV., p. 370 (1843).

† Journal of the Royal Society of Agriculture, Vol. III., p. 398.

Elkington's attention was specially directed to springs, and the merit of his system consisted of relieving the arable soil from the effects of water issuing from below upward. Now it is well known that, in many places, as much injury is done to crops by the retention of rain water in the soil as from springs. In cases where the soil retained the rains, fields could not be drained by an auger hole and a ditch or two.

Smith, of Deanston's system consisted in cutting parallel drains at regular intervals over the entire field, without regard to springs or other sources of subterranean moisture. His characteristic views were, in brief, as follows:

"1. *Frequent* drains at intervals of from ten to twenty-four feet.

"2. *Shallow* depth—not exceeding thirty inches—designed for the single purpose of freeing that depth of soil from stagnant and injurious water.

"3. '*Parallel drains, at regular distances*, carried throughout the whole field, without reference to the wet and dry appearance of portions of the field,' in order 'to provide frequent opportunities for the water *rising from* below and falling on the surface, to pass freely and completely off.'

"4. *Direction of the minor drains* 'down the steep,' and that of the mains along the bottom of the chief hollow—tributary mains being provided for the lesser hollows. The reason assigned for the minor drains following the line of steepest descent, was, that 'the stratification generally lies in sheets, at an angle to the surface.'

"5. *As to material*—Stones preferred to tiles and pipes."

From 1833 to 1854, several systems of drainage were advocated throughout Great Britain. All, however, agreed that "*tile*" was the best material for a conduit for the water; but these systems differed from each other in the distance between as well as the depth of the drains.

Drainage was readily introduced into Belgium and Germany, where it produced as happy results as in England. The governments of these respective countries cheerfully extended to the system all the encouragement which could reasonably be expected. To such an extent did these governments manifest their appreciation of the system, that they actually purchased tile machines, manufactured tile, and established depots for the sale of them at low rates, so as to place them within the reach of almost all tenants and landholders. The impulse thus given by government itself soon produced the happiest results. Experiments conducted here and there, at the instance of the government, convinced even the most skeptical of the great advantages to be derived from underdraining; the praises of the system found an echo in every nook and corner of the country; and nothing ever was so universally practiced in Germany in so short a time from the period of its first introduction as thorough draining.

DRAINAGE IN FRANCE.

From returns gathered about the middle of 1856, it appears that there were then about 80,000 English acres of thorough drained land, and 896 tile works in France. The money expended in draining, from 1850, when this improvement was begun in France, up to the summer of 1856, accordingly amounts to $8,000,000; the expense of draining being about $20 per acre.

During the draining season (autumn) of 1856, up to January 1, 1857, no less than 85,000 acres were drained.

Of these 165,000 acres, only 45,000 acres were drained by care or assistance of the government; the remainder is the work of private enterprise. When will American farmers become convinced that thorough draining is one of the *most* important aids to agriculture!

DRAINAGE IN THE UNITED STATES.

The introduction of tile drainage in the United States may be given in a very few words. The following account, prepared by a correspondent of the *New York Tribune*, and corrected and revised by the editor of the *Country Gentleman*, is perhaps the best account that has yet been written on the subject. It is true, we might state, that "Mr. John Johnston, of Geneva, N. Y., introduced tile draining on his farm in 1835; that, in 1848, John Delafield, of Seneca county, N. Y., introduced the first tile machine (Scragg's patent, imported from England);" and with this passing notice proceed to the next chapter. But those for whom this treatise is written will naturally inquire, "What induced him to drain? Where did he obtain tile? How much and in what manner did he drain? *What did it cost? Did it pay?*" and a host of other questions. It will, therefore, be satisfactory, even at the expense of some space, to present a detailed statement of all the circumstances surrounding and attending his efforts.

JOHN JOHNSON'S SYSTEM OF DRAINAGE.

Mr. John Johnston, near Geneva, N. Y., at one time esteemed a fanatic by his neighbors, has come of late years to be generally known as "the father of tile drainage in America." After thirty years of precept and twenty-two of example, he has the satisfaction of seeing his favorite theory fully accepted, and, to some extent, practically applied throughout the country. Not without labor, however, nor without much skepticism, ridicule and controversy has this end been attained; and if, now that his head is whitened and his course all but run, he finds himself respected, and appealed to by persons in every State of the Union, he does not forget that it has been by much tribulation that he has worked out this exceeding great weight of glory. Mr. Johnston is a Scotchman, who came to this country thirty-nine years ago, and purchased the farm he now occupies, on the easterly shore of Seneca lake, a short distance from Geneva. With the pertinacity of his nation, he staid where he first settled, through ill fortune and prosperity, wisely concluding that, by always bettering his farm, he would better himself, and make more money in the long run than he could by shifting uneasily from place to place in search of sudden wealth. He was poor enough at the commencement; but what did that matter to a frugal, industrious man, willing to live within his means, and work hard to increase them? And so, with unflagging zeal, he has gone on from that day to this.

HIS FARM.

His first purchase was 112 acres of land, well situated, but said to be the poorest in the county. He knew better than that, however, for although the previous tenant had all but starved upon it, and the neighbors told him such would be his own fate, he had seen poorer land forced to yield large crops in the old country, and so he concluded to try the chances for life or death. The soil was a heavy gravelly clay, with a tenacious clay subsoil, a perfectly tight reservoir for water, cold, hard-baked, and cropped down to about the last gasp. The magician commenced his work. He found in the barn-yard a great pile of manure, the accumulations of years, well rotted, black as ink, and "mellow as an ash-heap." This he put on as much land as possible, at the rate of *twenty-five loads to the acre*, plowed it in deeply, sowed his grain, cleaned out the weeds as well as he could, and the land on which he was to starve gave him about *forty bushels* of wheat per acre. The result was, as usual, attributed to luck, and anything but the real cause. To turn over such deep furrows was sheer folly, and such heavy dressings of manure would not fail to destroy the seed. But it didn't; and let our farmers remember that it never will; and if they wish to get rich, let them cut out this article, read it often, and follow the example of our fanatical Scotch friend.

This system of deep plowing and heavy manuring wrought its result in due time. Paying off his debt, putting up buildings, and purchasing stock each year, to fatten and sell, Mr. Johnston after seventeen years of hard work at last found himself ready to incur a new debt, and to commence laying tile drains. Of the benefits to be derived from drainage he had long been aware; for he recollected that when he was only ten years of age, his grandfather, a thrifty farmer in Scotland, seeing the good effects of some stone drains laid down upon his place, had said: "Varily, I believe the whole airth should be drained." This quaint saying, which needs but little qualification, made a lasting impression on the mind of the boy, that was to be tested by the man, to the permanent benefit of this country.

Without sufficient means himself, he applied for a loan to the Bank of Geneva, and the president, knowing his integrity and industry, granted his request. In 1835 tiles were not made in this country, so Mr. Johnson imported some as samples, and a quantity of the "horseshoe" pattern were made in 1838, at Waterloo. There was no machine for producing them, so they were made by hand and molded over a stick. This slow and laborious process brought their cost to $24 per thousand, but even at this enormous price, Mr. Johnson determined to use them. His ditches were opened and his tile laid, and then what sport for the neighbors! They poked fun at the deluded man; they came and counseled with him, all the while watching his bright eye and intelligent face for signs of lunacy; they went by wagging their heads and saying, "Aha!" and one and all said he was a consummate ass to put crockery under ground and bury his money so fruitlessly. Poor Mr. Johnston! he says he really felt ashamed of himself for trying his new plan, and when people riding past the house would shout at him, and make contemptuous signs, he was sore-hearted and almost ready to conceal his crime. But what was the result? Why this: that land which was previously sodden with water, and utterly unfruitful, in one season was covered with luxuriant crops, and the jeering skeptics were utterly confounded; that in two crops all his outlay for tiles and labor was repaid, and he could start afresh and drain more land; that the profit was so manifest as to induce him to extend his operations each succeeding year, and so go on until 1856, when his labor was finished, after having laid 210,000 tiles, or more than fifty miles in length! And the fame of this individual success going forth, one and another duplicated his experiment, and were rewarded according to their deserts.

It was not long after the manufacture of the first lot of tiles that a machine was contrived which would make quite as well, and faster; and by its aid they were afforded at quite as low a price as after an English machine was imported. The horsehoe tile has been used by Mr. Johnston almost exclusively, for the reason that they were the only kind to be procured at first, and on his hard subsoil, finding them to do as well as he could wish, he has not cared to make new experiments. He has drains that have been in function for more than twenty years without needing repair, and are apparently as efficient now as they were when first laid. In soft land, pipe or sole tiles would be preferable, or if the horseshoe were used they should be placed on strips of rough board, to prevent their sinking into the trench bottom, or being thrown out of the regular fall by being undermined by the running water. He has not used the plow for opening his trenches, for the reason that all his work has been let out by contract, and the men have opened them by the spade; charging from twelve and a half to fifteen cents per rod for opening and making the bottom ready for the tile. The laying and filling was done by the owner.

HIS PRACTICE.

His ditches are dug only two and a half feet deep, and thirteen inches wide at the top, sloping inward to the bottom, where they are just wide enough to take the tile. One main drain, in which are placed two four-inch tiles set eight inches apart, with an arch piece of tile having a nine-inch span set on top of them, was dug three and a half and four feet deep, and this serves as a conduit for the water from a large system of laterals. Drains should never be left open in winter, for the dirt dislodged by frequent frosts so fills the bottom that it will cost five or six cents per rod to clear them; and, moreover, the banks often become so crumbled away that the ditch cannot be straddled by a team of horses, and thus most of the filling must be done by hand. Mr. Johnston in draining a field commences at the foot of each ditch and works up to the head. He opens his mains first, and then the lateral or small drains, but he lays the tiles in the laterals and fills them completely before laying the pipe in the mains. The object of this is to prevent the accumulation of sediment in the mains, which would naturally be washed from the laterals on their first being laid. By commencing at the foot of each ditch and working upward, he can always get and preserve the regular fall, which may be dictated by the features of his field, more easily than by working toward the outlet. A little practice teaches the ditchers how to preserve the grade almost as well as if gauges were employed; but before laying the tiles, the instrument is applied to test the bottom thoroughly.* The necessity of this precaution will be apparent to any one who reflects that if a tile or two in the course of a ditch be set much too high or too low at either end, the water quickly forms a basin beneath and around, sediment is washed into the adjoining pipe, and ultimately even the whole bore is filled and the drain stopped. When this happens it will be indicated after a time by the water appearing at the surface of the ground above the spot—drawn upward by capillary attraction. In such a case the ditch must be reopened and the tile relaid.

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* I never used a leveling instrument. I always had water, which is the best instrument.—J. J.

ILLUSTRATIONS.

Mr. Johnston says tile-draining pays for itself in two seasons—sometimes in one. Thus, in 1847, he bought a piece of ten acres to get an outlet for his drains. It was a perfect quagmire, covered with coarse aquatic grasses, and so unfruitful that it would not give back the seed sown upon it. In 1848 a crop of corn was taken from it, which was measured and found to be *eighty bushels* per acre, and as, because of the Irish famine, corn was worth $1 per bushel that year, this crop paid not only all the expense of drainage, but the first cost of the land as well.

Another piece of twenty acres, adjoining the farm of the late John Delafield, was wet and would never bring more than ten bushels of corn per acre. This was drained at a great cost, nearly $30 per acre. The first crop after this was 83 bushels and some odd pounds per acre. It was weighed and measured by Mr. Delafield, and the county society awarded a premium to Mr. Johnston. Eight acres and some rods of this land, at one side, averaged 94 bushels, or the trifling increase of 84 bushels per acre over what it would bear before those insignificant clay tiles were buried in the ground. But this increase of crop is not the only profit of drainage; for Mr. Johnston says that on drained land one half the usual quantity of manure suffices to give maximum crops. It is not difficult to find a reason for this. When the soil is sodden with water, air cannot enter to any extent, and hence oxygen cannot eat off the surfaces of soil-particles and prepared food for plants; thus the plant must in great measure depend on the manure for sustenance, and of course the more this is the case the more manure must be applied to get good crops. This is one reason, but there are others which we might adduce if one good one were not sufficient.

Mr. Johnston says he never made money until he drained, and so convinced is he of the benefits accruing from the practice, that he would not hesitate—as he did not when the result was much more uncertain than at present—to borrow money to drain. Drains well laid endure, but unless a farmer intends doing the job well he had best leave it alone and grow poor, and move out West, and all that sort of thing. Occupiers of apparently dry land are not safe in concluding that they need not go to the expense of draining, for if they will but dig a three-foot ditch in even the driest soil, water will be found in the bottom at the end of eight hours, and if it does come, then draining will pay for itself speedily. For instance: Mr. Johnston had a lot of thirteen acres on the shore of the lake, where the bank at the foot of the lot was perpendicular to the depth of thirty or forty feet. He supposed from this fact, and because the surface seemed very dry, that he had no need to drain it. But somehow he lost his crops continually, and as he had put them in as well as he knew how, he naturally concluded that he must lay some tile. So he engaged an Irishman to open a ditch, with a proviso that if water should come into it in eight hours, he would drain the entire piece. The top soil was so hard and dry as to need an application of the pick, but at the depth of a foot it was found to be so wet and soft that a spade could easily be sunk to the entire depth of ten inches with but little force. The ditches were made, and in less than the specified time a brave lot of water flowed in. The piece was thoroughly drained, and the result was an immense crop of corn. The field has regularly borne 60 or 70 bushels since. Corn was planted for a first crop in this and the preceding instances, because a paying crop is obtained in one year, whereas if wheat were sown it would be necessary to wait two seasons. He always drains when the field is in grass, if possible, for the ditches can be made easily; and Spring is chosen that the labor may not be interfered with by frosts.

To show how necessary it is to avoid planting trees over drains, we quote a case in point. In a lot adjoining his house are four large elms which are marked to be felled, and for the reason that the lot was formerly so wet that a pond of water stood upon it in winter, and throughout the season the children skated and slid upon it. It was drained, and all went well for a time; but after seven years Mr. Johnston found his drains did not discharge properly, and that in certain places the water came to the surface, so as to destroy or greatly lessen the crop above them. He could not account for the circumstances until he dug down to the drain at each of these spots, when, to his surprise, he found the tile [two four-inch tile with a semi-circle of nine inch set on top of them] completely choked with fibrous roots of the elms.

Mr. Johnston says he never saw one hundred acres in any one farm, but a portion of it would pay for draining. Mr. Johnston is no rich man who has carried a favorite hobby without regard to cost or profit. He is a hard-working Scotch farmer, who commenced a poor man, borrowed money to drain his land, has gradually extended his operations, and is now reaping the benefits, in having crops of forty bushels of wheat to the acre. He is a gray-haired Nestor, who, after accumulating the experience of a long life, is now, at sixty-eight years of age, written to by strangers in every State of the Union for information, not only in drainage matters, but all cognate branches of farming. He sits in his homestead a veritable Humboldt in his way, dispensing information cheerfully through our agricultural papers and to private correspondents, of whom he has recorded 164 who applied to him last year. His opinions are, therefore, worth more than those of a host of theoretical men, who write without practice. He says that the retrogression of our agriculture in the older States, is to be accounted for in our lack of drainage, poor feeding of stock, which results in giving a small quantity of poor manure, and in not keeping enough to make manure. He applies twenty-five loads of manure to the acre at the beginning of a rotation, and this lasts throughout the course. He learned from his grandfather that no farmer could afford to keep any animal that did not improve on his hands, and that as soon as it was in good marketable condition it should be sold and replaced by another. This theory he has always carried out, and as a natural consequence, has always got higher prices for his beef stock, and a ready market in the dullest of times.

Although his farm is mainly devoted to wheat, yet a considerable area of meadow and some pasture has been retained. He now owns about 300 acres of land. The yield of wheat has been 40 bushels this year, and in former seasons, when his neighbors were reaping 8, 10, or 15 bushels, he has had 30 and 40. We are informed by him that there has been no such crop as the present since 1845, either in yield or quality; and the absence of weevil is remarkable. A variety of white wheat from Missouri, sown more thinly than usual, has yielded 31 bushels to something less than one bushel of seed sown. It headed out a fortnight earlier than the Soule's, but ripened later—probably because thinly sown. Mr. Johnston thinks we have been sowing too thickly for fifteen years past upon rich land, and there can be no question but that he is right. Still, it is better to take a medium course between thick and thin sowing, and thus avoid, on the one hand, rust, overcrowding, and waste of seed, and on the other, placing an entire crop at the mercy of insects which may attack it.

SALT FOR RUST.

As a sure preventive to rust, to give stiffness to the straw, and to expedite the ripening of wheat, by four or five days, Mr. Johnston sows five bushels of salt to the acre, broadcast, after seeding. He thinks, moreover, that for each of the five bushels of salt almost an extra bushel of wheat may be expected.

SIZE OF TILES FOR MAINS AND LATERALS.

A too common error with improving farmers is that of using too small tile for main drains, and too large for laterals. Those accustomed to the roomy conduits of ordinary stone drains, suppose that nothing less than a three inch bore will conduct the drainage from the surface into the mains; and curiously enough the same persons, unmindful of the large area drained by each system of laterals, err in using mains but little larger in bore than the latter. If any are willing to look into the results of the drainage on our Central Park, the most stupendous work of the kind in the country, and one of the best conducted, they will find that the one and a half inch and two inch tiles there used for laterals do not run full even after the most violent and protracted rains, and yet from a single "system" of twelve acres, the discharge after a recent rain was at the rate of 3,000 gallons per hour. This error of using too large tile Mr. Johnston fell into, and now that he has learned better after a twenty years' experience, he cautions his brother farmers against using larger than two inch tile for laterals. For mains each farmer must provide as the quantity of water to be conducted is greater or less. In many cases Mr. Johnston has used two rows of four inch, in others six inch, and in one, semi-circles of eleven inches, one as top and one as bottom, making a pipe nine inches bore to discharge water. At first he had many to take up and replace with large pipe to secure a complete discharge. Main drains he makes six to eight inches deeper than those emptying into them—not with an abrupt shoulder, but leveled up, so that the descent may take place gradually in the length of two tiles—29 inches—and always giving the laterals a slight sidewise direction at the end, so that their water will be discharged down stream into the mains.

Another error he at first fell into was, in having too many drains on lowlands, and not enough on the uplands; thus seeking to carry off the effect, while the cause—the outcropping springs on the hillside—remained untouched. Where the source of the water is most abundant, the means for removing it should most abundantly be furnished. Rain water falls on hills, sinks to an impervious stratum, along which it runs until it either finds a porous section through which it can fall to a lower level, or not finding such, continues on the hard bottom of the side of the hill, where it crops out in the form of a spring. If this spring water is suffered to run down hill, it washes the hillside more or less, and coming to the lowland, sinks as far as it may into the soil, makes it sodden, and produces bad effects. To drain effectually, then, we must cut off the supply above, and fewer drains will be necessary below. Here is the whole secret of the thing, and here we see why so much money is spent to so little purpose by those who think that they should only drain wet lowland. Appearances are deceitful, and we should not suppose that a seemingly dry upland is really dry.

Tile works have been established at many places in New York state, in several places in Massachusetts, in twelve or fifteen counties in Ohio. Some five or six different tile machines are in active operation at Cleveland, and are unable to supply the demand; in fact so far as demand is concerned, the same may be said of every place at which tile are made in Ohio. Michigan, Indiana, Maryland and several other states have tile works.

Considerable draining has been done in the north-west part of Ohio, in that region more familiarly known as the *Black Swamp*—a peculiar formation extending over several counties—by means of open ditches. Brush, wood and stone drains are not unknown in Ohio; and within a few years past upward of four hundred miles of underdraining have been done in Union, Clark, Madison, Fayette, Highland and Clinton counties, by means of the so-called *mole plow.*

THEORY OF DRAINAGE.

The chief object of drainage is to liberate the superfluous moisture in springy land, or such lands as have an impervious strata near the surface of the soil—the carrying away of the water which accumulates on the surface, from rains, snows, or freshets, is a secondary object only of thorough drainage. Where there are springs, there is a continued tendency of the water to force through the superincumbent strata, so as to rise and spread over the surface—such land must, even in times of drought, contain more than a proper amount of moisture.

Where there is an impervious subsoil, it is there where subterranean waters accumulate and remain a given period, and then, perhaps, disappear. As a general thing, this ground water sinks the deepest, late in the summer; in autumn it begins to rise, and in winter and spring it attains its maximum hight. Now, when the winter and spring waters, from rains and snows, from the surface, find their ways down to the waters retained, and resting on the subsoil, then the entire soil becomes too thoroughly saturated with moisture to admit of tillage operations. Winter grains will not succeed at all in such a soil, and summer crops are at best very precarious. The roots of winter plants, in quest of nourishment, penetrate to the subsoil, and finding a superabundance of water there, become dropsical, and, consequently, perish; but if the roots can possibly find their way into a drier portion of the soil, even by returning toward the surface (they not unfrequently do so), yet even then they become diseased, and the plant becomes unthrifty and yields but a small product; for, according to the natural tendency, every plant pushes its roots downward, and if it does not succeed, it is prevented only by the stony or watery condition of the subsoil. But even when the water is withdrawn from the surface of the field, there is still but little to be hoped for in regard to cultivated plants; for the soil, previously softened, now hardened by the influence of the sun's rays and air, does not permit the requisite circulation of air, and prevents the extension of the roots. A very natural consequence is, that the plants become diseased and yield but little.

The same condition of things exists also with respect to summer crops upon wet grounds. Late sowing, alone, can succeed; the water-hardened soil is very difficult to work, and, therefore, affords a very incompetent nidus or bed for the growth of plants. Consequently, plants succeed badly, under all these circumstances; an entire failure of the crop, indeed, may occur, if a sudden violent rain unites its influence with the rising ground water.

Now a rational agriculture requires that the spring and ground water be removed; for, however necessary moisture in the soil may be for the successful growth of the plants, yet, as we have experienced, an excessive moisture produces the opposite effect. An excess of moisture in the soil, recognized by certain water plants, such as bent-grass, reeds, shave-grass, moss, ranunculacœ, etc., growing, and gradually crowding out useful plants. The color and condition of the plants themselves, also indicate the superabundance of moisture in the soil. They are generally coarse and reddish, when their plants vegetate in excessive moisture. The standing of rain or snow water upon the surface, is also evidence of a superabundance of moisture, or if, afterward, rents or cracks appear, or a crust of ice form in the furrows at the slightest frost. Finally, the appearance of the soil at certain seasons, shows that it suffers on account of too much water. If, for example, the spring winds have dried the surface of the ground, so that one would think all the moisture gone, and dark spots present themselves upon the surface, this shows that much water stands there.

We will now proceed to give a chapter on soils generally, and their properties, then to state how drainage operates, and also discuss the advantages of underdraining by demonstrating—so far as *theory (not hypothesis)*, in its proper sense, is susceptible of demonstration—that drainage,

I. Removes stagnant waters from the surface.
II. Removes surplus water from under the surface.
III. Lengthens the seasons.
IV. Deepens the soil.
V. Warms the under soil.
VI. Equalizes the temperature of the soil during the season of growth.
VII. Carries down soluble substances to the roots of plants.
VIII. Prevents "freezing out," or "heaving out."
IX. Prevents injury from drought.
X. Improves the quality and quantity of the crops.
XI. Increases the effect of manures.
XII. Prevents rust in wheat and rot in potatoes.

CHAPTER I.

PROPERTIES OF SOILS.

In a work of this character, it may not be necessary to describe the chemical composition of soils, although very proper to state what properties are desirable for remunerative cultivation. It not unfrequently happens that the properties or qualities of soil are inherent: that is, the cause of productiveness is to be ascribed to the peculiar combination of substances composing the soil, which no chemical analyses have yet been able to discover, and which has not been produced by any artificial combination or process. Scientific investigations of the soil have accomplished little else than a determination of the elementary substances or constituents, as well as some inherent properties, such as color, weight, and facility of combination with other ingredients. A practical examination of the adaptation of soil for cultivation, renders a consideration of some of the other properties necessary.

The physical properties of the soil are of very great importance, so far as the culture of plants is concerned. It may, perhaps, not be asserting too much to say, that the physical properties of the soil exert a more direct influence upon the plant, upon the atmosphere in contact with it, and upon water, than do the chemical combinations of its elements. The degree of fineness of the mineral particles of the soil; its power of cohesion, moisture; its adaptation to the percolation of water, and permeation of atmosphere; its power to absorb moisture by capillary attraction, to absorb gases, to retain heat or warmth, exert, perhaps, a greater influence than is generally believed. Therefore, it is, why soils frequently are nearly identical in their chemical analyses, yet differ so materially in their productiveness. Underdraining proposes simply to affect the physical condition of the soil without disturbing its chemical composition.

Clay—Pure clay forms a very heavy and compact soil; but if it is burned and then ground, it forms a very porous soil, and is much better adapted to the growth of crops. A soil in which silicious (flinty sand), and calcareous (limey) earths predominate, becomes so hot and parched, that the plants wither and die; on the other hand, if these same substances are finely comminuted or reduced to powder, they form a soil which absorbs entirely too much moisture, and plants suffer in consequence.

One hundred pounds of calcareous earths in an ordinary state will absorb twenty-nine pounds of water, but when finely comminuted will absorb eighty-five pounds.* Silicious earths, which usually retain no more than twenty-five per cent. of moisture, when properly prepared in a chemical laboratory, may be made to retain two hundred and eighty per cent. of moisture.

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* Gerardin's Views of Agriculture.

The variety of colors in soil is not very considerable, generally brown or gray, changing into yellow; but sometimes it is found very red or black; sometimes it is strongly inclined to white, blue or green, and sometimes almost endless shades present themselves. The soils all appear much darker in the field than in the laboratory, because in the former place they are always moist, and in the latter dry. The predominating mineral constituent generally imparts the color to the soil—thus, a soil in which *iron* predominates, is of a reddish hue, an aluminous one, yellow, a calcareous one, bluish or whitish. When humus (decayed vegetable or organic matter) is mingled with a soil, it assumes a dark brown or blackish appearance, so that, in course of time, the original color of the soil will entirely disappear. Porphyry, mica schist, the clay slates, and the various sandstone formations produce a reddish soil. Basalt produces a brown or black; serpentine, green; phonolite or clinkstone (a feldspathic rock), white; sandstone, plaster and white lime produce a whitish gray soil. Humus (when derived from turf alone) produces at first a grayish brown, but eventually a black soil. Luster occurs in connection with color only in instances where a moist clay has been overturned by a polished plow or other smooth metallic substance. When such polished surfaces occur on the soil, as it is being plowed, they are unmistakable evidence of comparative non-productiveness, because they indicate a want of humus and porosity. Soils in which *mica*, or small shining particles, abound, is generally not of good quality.

The color is of great importance in practical agriculture, from the well-known fact that dark colors always retain the heat from the sun much longer than light colored ones.

Dark soils are generally acknowledged to be more productive than light ones—but this fertility is due to other causes, perhaps, in as great a degree, as to the color—they generally contain humus, or at least some organic matter. If, then, we assume the importance of the color of the soil as a fixed fact, and as a condition having an influence on temperature, we then have some data from which the amelioration or improvement in a physical aspect is to be determined.

Experience has taught that coarse dark particles of soil retain warmth longer than fine particles; hence, intelligent gardeners often mix muck, fine coal, bonedust, etc., with some calcareous soil, and distribute it among the soil in the hotbeds, and between the grapevines, when they wish to force fruits and fit them early for market. Sometimes they strew bits of slate around the plants—"this is mainly practiced on the banks of the Moselle, Nahe, Maas and the Rhine."* On a dark soil the vine always becomes more juicy, and contains more saccharine matter than on light soils in the same situation in all other respects.

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* Yager's Bodenkunde.

Numerous experiments might be cited to prove that the color of the soil varies the temperature nearly fifty per cent. For example: if a calcareous clay soil is placed in a white flower pot, and exposed to the rays of the sun, it will increase sixteen degrees only in temperature, while the same soil in a *black* pot by the side of it, will have increased twenty-four degrees. Gerardin asserts that the period of ripening potatoes is varied from eight to fourteen days, by the color of the soil. In proof of this, he planted at the same time, an equal number of varieties in different soils, and found that in white clay sixteen varieties; in yellow clay, nineteen; in whitish sandy soil, twenty, but in dark humus soil, twenty-six varieties, had fully ripened at the same time.

As the density or compactness of soil is differently understood by different parties, we shall endeavor to be as explicit as possible on this point. Generally, by density or heaviness, is understood the amount of pressure which one body exerts on another, or in other words, density and specific gravity are regarded as synonymous. But in agricultural literature, heaviness is rather synonymous with compactness or cohesiveness, than with weight. By a *heavy* soil, is meant one that is difficult to work, on account of its adhesiveness; the term is really applicable to clay soils only, because they are capable of retaining a large amount of water, and because clay, of itself, is comparatively *heavy;* but, at the same time, a sandy soil is termed a *light* soil, although its specific gravity is greater than that of the clay. Practically, the specific gravity of a soil is of little importance. During a rise of waters, the sandy particles always settle at the bottom, while the really fertile portions are deposited on the top of the ground as the water recedes.

As a general thing, a soil of great specific gravity is porous, while those really lighter, by weight, when dried, are the heaviest to work. From the foregoing, it will be observed that cohesion is of much more importance than specific gravity. As the soil is composed of many particles of different substances, it will either be tenacious or mellow, compact or loose, in proportion as one or several of the component parts predominate; therefore, as soils are composed of almost all possible proportions of these several elements, soils will be found of all corresponding degrees of tenacity or porosity—hence, having a knowledge of the combining elements to produce a soil, we term a tenacious soil, a *heavy* one, and a mellow or porous one, a *light* one without any regard to its actual specific gravity.

The greatest degree of cohesion is termed *tenacious*, *strong*, or impervious. Thus, we say a tenacious clay, a strong clay, or an impervious clay. A compact soil is one in which the particles adhere so strongly to each other as to be difficult of separation, and that can not be crumbled by the fingers. A *tough* soil is always a compact one when dry; a tough soil is difficult to till when wet or moist, and no less difficult when dry.

A mellow soil is one that will crumble upon slight pressure in the hand. Clay soils may be made mellow by the application of sand, humus, and by frosts in the course of cultivation, but they are never mellow without the aid of man.

The cohesion of the soil depends entirely upon the amount of clay incorporated with it—the larger the proportion of clay is, the more cohesive will the soil be, and the more sand it contains, the mellower it will be. According to Schuebler's experiments, the following named soils exhibited the degree of tenacity or cohesion placed in the corresponding columns:

Description of soil.	Degrees of cohesion.	Cohesion according to weight.
Pure clay	100.	24.
Pipe clay	83.3	19.
Brickmaker's clay	68.8	15.3
Common clay	57.3	13.2
Loamy clay	33.	7.5
Slaty marl	23.	5.2
Carbonate of magnesia	11.5	2.3
Humus	8.7	1.5
Plaster of Paris	7.3	1.2
Fine calcareous soil	5.	1.
Sand	0.	0.

The more cohesive a soil is, the greater is its liability to be adhesive in a moist state. This adhesion often renders an otherwise productive soil very undesirable, on account of the resistance it offers in tillage. Some German writer, whose name I can not ascertain, instituted a series of experiments to determine the positive as well as comparative amount of "*adhesive resistance*" to implements generally employed in agriculture, the results of which are embodied in the following table:

Moist soils.	Degree of adhesive resistance to agricultural implements exerted by a superficial square foot, on—	
	Iron.	Wood.
Pure white clay	27.	29.2
Pipe clay	17.2	18.9
Fine calcareous earth	14.3	15.6
Gypseous earth	10.7	11.8
Brickmaker's clay	10.6	11.4
Humus	8.8	9.4
Common clay	7.9	8.9
Loamy clay	5.8	6.4
Magnesian earth	5.8	7.1
Slaty marl	4.9	5.5
Lime sand	4.1	4.4
Quartz sand	3.8	4.3

Many other properties are connected with the cohesiveness of the soil, such as the permeability of water, capillary attraction and retention of moisture, penetrability of the atmosphere, retention of warmth, etc.

A cohesive or compact soil is, in consequence of its tenacity and retention of moisture, always cool or cold, because, in the first place, it is impermeable to the air, and does not absorb and retain the warmth of the sun, but loses its moisture through evaporation only; and it is a well-known fact that evaporation is a cooling process. On the other hand, a mellow soil is warm, because it does not retain moisture, and is not cooled by evaporation.

A cohesive soil contracts or shrinks when dried. This contraction causes wide and sometimes very deep fissures or cracks, while a mellow soil does not perceptibly either contract or expand, but settles down and becomes more compact. A pure humus soil contracts as much if not more than clay, during a season of drouth, but is held together in masses by vegetable fibres, with which it is interspersed; but whenever sand is mixed with humus, it ceases to contract. The best and cheapest method of ameliorating a clay soil is to underdrain, and expose it as thoroughly as possible to the action of frost. For this reason it should be plowed into ridges, even if very cloddy, in the fall, so that the frost may have the largest possible amount to operate on, and by spring it will be found to be much ameliorated.

Retentiveness of Moisture.—The capacity to retain moisture and exclude the permeation of the atmosphere depends entirely upon the cohesiveness of the soil. A cohesive soil is almost impervious, while a mellow soil is always porous. Pure clay will retain water until it is exhausted by evaporation, while pure sand is so porous that it may be said to swallow the water. Neither of these extremes is a desirable quality, but a medium or mean between the two is really what is requisite. It is always better to have a soil too porous than to have one too compact. A well-tilled soil is seldom so compact as to retain moisture in quantities to act injuriously upon vegetation. Every effort, therefore, which will remove surplus moisture, or such moisture as is in actual excess of the absolute amount required for vegetation, is an effort to assist nature, and consequently is in the right direction.

By porosity of the soil, must be understood not merely its adaptation to permit water to filter through it, but also the capacity to draw moisture from the subsoil by or through capillary attraction. It is a well-known fact, that mellow soils are, even in times of drought, more moist than tenacious or compact soils are; they absorb moisture from below, on the same principle that the sponge absorbs and elevates moisture. Even a very sandy soil, resting on an impervious or tenacious subsoil, is better adapted for crops during a drought than a heavy clay soil, solely on account of its capillary capacity.

But an essential quality of a good soil is, that while it is porous enough to filter the surface water, and possesses a proper capillary capacity, that it at the same time possesses another important quality, namely, the retention of moisture. This latter quality appears to depend upon the decomposition and comminution of the mineral substances, and the decay of organic materials of which the soil is composed. Every kind or quality of soil will absorb or imbibe a certain amount of moisture, until it is completely saturated, and the remainder will drip or flow away. The amount imbibed is generally less than the weight of a given quantity of the soil.

Schuebler, it appears, took a pound of the various kinds of soil, after they were thoroughly dried, then saturated them with water and weighed them; the excess of weight when saturated over the weight when dry, of course, would give the capacity of retaining moisture. Thus, if a pound of soil when dry weighed a pound, but a pound and a half when saturated, it is very evident the absorbing capacity of that soil is 50 per cent. From Schuebler's experiments we have compiled the following table:

Soils.	Absorbing capacity per cent.	Soils.	Absorbing capacity per cent.
Quartz sand	25	Common soil (what kind?)	52
Gypseous soil	27	Pipe clay	61
Lime sand	29	Pure clay	70
Slaty marl	34	Fine calcareous earth	85
Loamy clay	40	Fullers' earth	87
Calcareous soil	47	Humus	181
Brickmakers' clay	50	Fine magnesia	256

This table presents several very striking facts. In the first place, it shows that coarse particles, like sand, retain less moisture than the same material when finely comminuted. For example, the lime, when reduced to particles of the size of common sand, will retain 29 per cent. only of moisture; while a limy soil (clay and lime) will retain 47 per cent., and the limy soil, reduced to powder, will retain 85 per cent. Now, as under-draining and culture reduce the particles of soil, it is very evident that the longer soils are cultivated the greater will be their retentive capacity.

Light clay soils appear the best adapted to retain moisture, while at the same time they appear to have a more desirable kind of porosity than either sand or heavy clay. Humus absorbs the largest proportion of water, but when it parts with it not unfrequently becomes so dry that it floats on the water; it is not an *active* absorber.

Another quality which is possessed by soils, and proper to be mentioned here,] is the degree of rapidity with which soils part with the imbibed moisture. It is very evident that the sand will part with its 25 per cent., in the form either of a filtration or an evaporation, much sooner than brickmakers' clay will, with its 50 per cent., or humus its 181 per cent. To determine this point precisely, Schuebler exposed soils containing 100 parts of water to a heat of 66° F., during a period of four hours. He found the water in

	Evaporated. Per ct.		Evaporated. Per ct.
Quartz sand	88.4	Common soil (what kind ?)	32.
Lime sand	75.9	Pure clay	31.9
Gypseous earth	71.7	Fine calcareous soil	28.0
Slaty marl	68.8	Garden soil (what kind ?)	24.3
Loamy clay	52.	Humus	20.5
Brickmakers' clay	45.7	Magnesia	10.8
Pipe clay	34.9		

As a laboratory experiment, this table may be very valuable, but in practical agriculture we do not consider it very reliable, or of any absolute value. Every one knows that the exposure toward the north or south, east or west, would materially affect the retentive quality, so far as evaporation by the sun's rays is concerned; and equally as much would they be affected by the winds. A sharp north-west wind might "dry up" a clay soil as much as the sun would dry up a humus soil. Then, too, if furrows are plowed deep and narrow, more surface will be exposed to the action of the elements than if plowed wide and shallow. A sandy soil, covered with a mat of grass, would not evaporate moisture as rapidly as an exposed clay would.

The property of expansion and contraction of soils is intimately connected with the capacity of absorbing and retaining moisture. Some soils, when fully saturated, do not expand a particle, while others expand very much; those which expand the most when saturated, also contract the most when the moisture is exhausted. The comparative expansive or contractive capacity of soils may be very readily determined in the following manner: take a common brickmaker's mold, and fill it with thoroughly saturated soil, as compactly as possible, with the hand, then expose it either for days in unobstructed sunshine, or else expose it to artificial heat, not exceeding 212° Fahrenheit; when the soil is thoroughly dried, it will be found—according to the kind employed—to have shrunk more or less. Schuebler's investigations indicated that

1000 parts of	Will contract. Parts.	1000 parts of	Will contract. Parts.
Lime or quartz sand	0.	Pipe clay	114.
Calcareous soil	50.	Carbonate of magnesia	154.
Loamy clay	60.	Pure clay	183.
Brickmakers' clay	85.	Humus	200.
Slaty marl	95.		

These experiments confirm repeated observations, that a soil in which clay predominates always contracts, and becomes full of fissures or cracks, when it is perfectly dry; but that in sandy soil no change takes place. But every day's experience contradicts the statement relative to humus in the above table; it is a well known fact, that humus or turf never cracks, even in the hottest and driest weather. There is no doubt that cracking is in a very great degree due to the amount of moisture contained, and the rapidity with which it is evaporated. The same soil will contain many more fissures, if dried suddenly, than if dried slowly.

Another property inherent in soils must not be omitted, namely, the capability of absorbing moisture from the atmosphere. This property manifestly is dependent on the porosity of the soil; for it is very evident that a soil which readily absorbs a rain fall, will also absorb moisture when it is presented in the form of a fog or dew, or even from the atmosphere direct. We must again refer to Schuebler to ascertain the degree in which this property is possessed by the various soils. He took 1,000 grains of dried soil of each kind, and spread each kind respectively on a surface of 50 inches, and found that

	Absorbed in			
	12 hours. Grains.	24 hours. Grains.	48 hours. Grains.	72 hours. Grains.
Quartz sand	0	0	0	0
Gypseous earth	1	1	1	1
Lime sand	2	3	3	3
Common soil (what kind?)	16	22	23	23
Loamy clay	21	26	28	28
Slaty marl	24	29	32	33
Brickmaker's clay	25	30	34	35
Fine calcareous earth	26	31	35	35
Pipe clay	30	36	40	41
Garden soil, having 7 per cent. humus	35	45	50	52
Pure clay	37	42	48	49
Fine magnesia	69	76	80	82
Humus	80	97	110	120

It will be seen at a glance that the greatest proportion of the moisture is absorbed during the first *twelve* hours. Soils in the fields seldom, if ever, become so thoroughly dried as those employed in Schuebler's experiments; hence the absorption will necessarily be much less than the proportion stated in the table. The experiments simply confirm every day's observations, that the absorbing powers of clay are increased by the addition of sand; but *practice* does not confirm the statement with regard to humus. It is a well known fact, that a piece of humus, so dry that it will float, may lie in a damp cellar, or other moist place, for months, without absorbing a perceptible amount of moisture.

Porosity is, after all, of more importance than the property of absorbing a large quantity of moisture, because in a porous soil moisture can penetrate to a greater extent. Although quartz sand does not absorb any appreciable amount of moisture, it is a well ascertained fact that a moist atmosphere is productive of good results on a sandy soil; plants flourish and grow well, while under the same conditions they very soon die away in a heavy clay. What practical benefit is then to be derived from the great absorbing power of clay, if the moisture is confined to the surface only; while in sand, with no power of absorption, the particles of moisture can penetrate everywhere? But it is asserted that the air absorbs more moisture from the soil than it imparts to it; however true this assertion may be, the advantages to growing crops of moisture imparted to the soil from the atmosphere, is acknowledged by every intelligent and observing agriculturist.

The capacity of soils to absorb gaseous elements from the atmosphere, is one of the most important properties. The fertilizing properties of gaseous elements are so well known, and generally acknowledged, as not to require any illustration or argument; the only object really accomplished by plowing is, a loosening of the soil, so as to permit the permeation of the atmosphere, and consequently absorption of gases and moisture from it by the soil. The most important, as well as most universal of these gases is oxygen; it combines chemically with moist (never with *dried*) soil, as well as it combines physically or mechanically with hydrogen to form water. "Sprouting," or germination, would be utterly impossible without oxygen; hence, seeds germinate much more readily in a properly-formed seed-bed—that is, where the soil has been reduced to mellowness and ordinarily well pulverized, than in a soil not so prepared. In proof of this assertion, we need only refer to the fact that, in forests, seeds of indigenous plants frequently become so completely excluded from the action of the atmosphere, that, when again exposed to it, after the lapse of many years, they at once germinate and grow.

Subsoils, or such soils as lie beneath the surface and beyond the influence of the atmosphere, are termed "*dead*" or "*wild*" soils, and are, as a matter of course unproductive. But as soon as they are exposed to atmospheric influences, and especially the action of the frost, they become very productive. Some soils possess the property of absorbing gases in a much greater degree than others; blue clay, or hard pan, for instance, does not possess this property in any very considerable degree: hence, it must be exposed a very long time to atmospheric influences before it becomes fertile. We must again refer to Schuebler's experiments for the precise degrees in which the different soils possess the property.

	Absorbs. Per cent.		Absorbs. Per cent.
White humus	20	Clay slate	11
Rich garden soil	18	Brickmakers' clay	11
Magnesia	17	Fine calcareous soil	10
Good arable soil	16	Yellow clay	9
Pure clay	15	Lime sand	5
Pipe clay	13	Gypseous earth	2
Slaty marl	13	Quartz sand	1

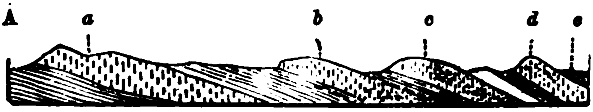
No less important than any of the qualities already enumerated, is the property of absorbing and retaining warmth. This property depends entirely upon the color, compactness, porosity, moisture, and the exposure to the rays of the sun. We have already referred to the fact that dark soils absorb and retain the sun's rays, while light colored soil reflect without absorbing them. In the course of the succeeding chapters, we shall fully discuss the effects of the absorption of warmth, and its consequences; nothing further need be remarked here, than to refer to Schuebler's experiments for the degrees or proportion in which the various soils possess the property of absorbing and retaining heat.

Soils.	Retentive capacity.	Soils.	Retentive capacity.
Lime sand	100	Pipe clay	68
Slaty marl	95	Pure clay	66
Quartz sand	95	Garden soil (what kind?)	64
Hard Pan, or "Blue clay"	76	Fine calcareous earth	61
Gypseous earths	73	Humus	49
Brickmakers' clay	71	Fine magnesian soil	38
Arable soil (what kind?)	70		

From this it will be seen that a limy or sandy soil is much warmer soil than the clays: hence, a loamy soil, having a proper admixture of sand, is warmer than a clay soil.

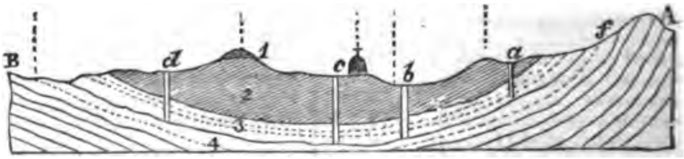
Many persons suppose that the soil differs from the subsoil, in no other respect than that the *soil* has been cultivated, and has in consequence assumed a more porous character. While this in some cases may be correct, it can by no means be adopted as a rule. The subsoil, as a general thing, is a distinct geological formation from the soil itself—the soil may be a sandy loam, while the subsoil is an impervious clay—or the soil may be a loam, while the subsoil is gravel and sand. Where the subsoil gravelly or sandy, as a general thing, drainage is necessary; yet, there are cases, which we will discuss in the proper place, where gravelly subsoils require drainage as imperatively as clayey ones do. If the subsoil were *always* as porous as the cultivated soil, there would be less occasion for thorough drainage, but as this is not the case, drainage becomes necessary if not indispensable.

The crust of the earth is composed of rocks, or of the material which once was rock, disposed in strata, one above the other, like the concentric *peels* of an onion, but the regularity of stratification has, in many places, been interrupted by earthquakes and volcanic action.*



[FIG. 1.]

In passing over a region of country from A to *e*, Fig. 1, we may find at A, a deposit of shale, but it soon disappears, and we find we are traveling on limestone as at *a*, then we find the limestone disappearing, and we are on a heavy clay; at *b* we find ourselves on a sandstone formation, then again on a heavy clay; then at *c* we find it gravelly, then shale, perhaps, and again a clay formation at *d*. The soil which may be represented by a line just above the upper edge of these formations, as from A to *b*, is, perhaps, a mixture of all the rocks on which it rests, and demonstrates, very clearly, why the subsoil may be different at different points, under the same kind of soil, as at A and *a*, or *b* and *c*. A farm situated at *c*, would not require any drainage; while one situated between *a* and *b*, would not be of any great value without it.



[FIG. 2.]

In the annexed Fig. 2, A and B, represent portions of stata elevated by volcanic action, forming a basin, B 3 *f*, in which the strata, 1 and 2, have subsequently been formed. Now, suppose 1 to represent a deposit of gravel, 2 a deposit or formation of blue or yellow clay, 3 a lime rock, and 4 a sandstone strata. The rains falling at B and at *f*, will readily percolate toward the center of the basin, because the strata is porous, while the rains from *a* to *d* will penetrate the earth very slowly. A field situated at B, although actually lower than one at *d*, may, nevertheless, be much drier, and in a workable condition, while the one situated at *d*, is saturated with moisture. All the rain falling between *a* and *d*, except that which flows from the surface and that evaporated, will penetrate until it reaches the limestone strata, 3, which is impervious, and of course, arrests its further progress—the result is, that at *b* a *swamp* is formed from the excess of water which can find no outlet or means of escape.

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* Volcanic forces have operated from beneath upon most of the older rocks, whereby they have been bent upward. The weight of the ocean, drift, etc., has bent them downward; gravity and other agencies more local, have produced a lateral pressure, especially when the strata were highly inclined; and these various agencies will account for nearly every case of flexure, not only of the laminæ, but of the beds also.—*Hitchcock's Elementary Geology*, p. 18.

This same figure may serve to illustrate the principle of artesian wells. Strata No. 4, being porous, is constantly saturated with water, and is what is termed a *water bearing rock*. Now, if the strata 4 be penetrated at *a* or *b*, the pressure from *f* will cause the water to rise at *a* or *b*, to the same level of *f*; at *c*, the water would rise to the level of the earth only, being in the center of the basin, the water would not rise higher than the outcrop of the strata, as at B; at *d*, it would not rise to the surface, and at 1 it would remain at some distance below the surface.

CHAPTER II.

HOW DRAINAGE OPERATES—HOW IT AFFECTS THE SOIL.

It would be no difficult matter to collect a volume of experiments, made in laboratories and elsewhere, which were made to ascertain the precise workings of drainage. One of the most cheap, simple, and at the same time most satisfactory experiments, to determine the *advantage* of draining, is the following: Take two ordinary earthenware flowerpots, the one having a hole or perforation in the bottom, and the other to be without any orifice in either sides or bottom. Fill both with precisely the same quantity and quality of soil, and plant in each, either growing plants or seeds of any ordinary cultivated plants. The perforated pot will represent a drained soil, while the other represents an undrained one. Give to both the same exposure, and the same quantity of water. If *seeds* are sown in both, those in the perforated pot will germinate the soonest, and the plants become the thriftiest and hardiest; sometimes, though seldom, the plants in the other pot will not germinate at all; but generally, they do germinate, although they produce only sickly and slender plants. In this manner, the *effect* of drainage is completely demonstrated.

If both flowerpots are placed in earthen saucers or dishes, and water poured in the dishes, that pot having the perforation will absorb the water by capillary attraction—the plant will receive its due proportion, and thrive; while the unperforated pot will not absorb any water, and the plant will suffer from *drought;* thus showing the *effect or benefit* of drainage in times of drought.

A belief has obtained, that drains are of advantage or beneficial to the soil only, when they are conducting away the surplus waters from showers. It certainly is a great advantage to the plants to be relieved from surplus water, as soon as possible, but it is, at the same time, no less an advantage to be supplied with new oxygen, and to have the old removed. An undrained soil can not make these changes in its gases, for the benefit of the plant, as well as a drained soil. This aeration of the soil is absolutely necessary for the health and growth of plants. Plowing is nothing more or less than aerating the soil; and every one conversant with farming operations, is well aware, that plants grow best on a finely pulverized soil—that is, in other words, on a well aerated soil.

Oxygen is no less essential to the roots of plants, than it is to the lungs of animals; but if the oxygen is not changed, the result is very unfavorable to the plants. Every rain which falls on a porous or drained soil, brings not only new solvents of the inorganic materials which nourish the plants, that have already been oxydized, and thus prepared for the advent of another rain, but when it falls on an undrained or impermeable soil, it diminishes the amount of oxygen, and produces permanent injury to the plants, by the excessive amount of stagnant water, and by lowering the temperature for a longer period than is consistent with the health of the plant.

No fear need be entertained that any clayey or loamy soil can be *over* drained; or, in other words, that so much moisture may be drained out of the soil, as not to leave sufficient remaining for the use of any plants which may appropriately be grown in the soil.

All soils have what is termed "*capillary attraction*," that is, the power to suck up, or elevate to the surface mineral matters in solution, or moisture from the subsoil; and the finer the soil is pulverized, the stronger the capillary attraction. In proof of this position, the following, from the pen of J. H. Salisbury, an agricultural chemist, formerly of New York, now of Ohio, is here inserted:

"From numerous observations which have been made at different times on the peculiar appearance of the surface of soils, clays, etc., during the warm summer months, and the fact that they, when covered with boards, stones, or other materials, so as to prevent them from supporting vegetation, become, in a comparatively short time, much more productive than the adjacent uncovered soil, we have been led to the belief that the soil possessed some power within itself, aside from the roots of plants, of elevating soluble materials from deep sources to the surface.*

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* Dr. Alex. H. Stephens, of New York, was, I think, the first to suggest this idea. He speaks of it in his address, delivered before the State Agricultural Society of New York,

"To throw some light upon the subject, in May, 1852, I sunk three boxes into the soil—one 40 inches deep; and 28 inches deep, and a third 16 inches deep. All three of the boxes were 16 inches square. I then placed in the bottom of each box, three pounds of sulphate of magnesia. The soil which was to be placed in the boxes above the sulphate of magnesia, was then thoroughly mixed, so as to be uniform throughout.

"The boxes were then filled with it. This was done on the 25th of May, 1852. After the boxes were filled, a sample of soil was taken from each box, and the per centage of magnesia which it contained accurately determined. On the 28th of June, another sample of surface soil was taken from each box, and the per centage of magnesia carefully obtained as before.

"The result in each case pointed out clearly a marked increase of magnesia. On the 17th of July, a sample of surface soil was taken a third time from each box, and carefully examined for magnesia; its per centage was found to be very perceptibly greater than on the 28th of the preceding month. On the 15th of the months of August and September following, similar examinations severally were made, with the same evident gradual increase of the magnesia in the surface soil.

"The following are the results as obtained:

	Per centage of Magnesia		
	Box 40 in. deep.	Box 28 in. deep.	Box 16 in. deep.
May 25	0.18	0.18	0.18
June 28	0.25	0.30	0.32
July 17	0.42	0.46	0.47
August 15	0.47	0.53	0.54
September 15	0.51	0.58	0.61

"Before the middle of October, when it was intended to make another observation, the fall rains and frosts had commenced; on this account the observations were discontinued. The elevation of the magnesia, as shown in the above experiments, evidently depends upon a well-known and common property of matter, viz: the attraction of solids for liquids, or what is commonly denominated capillary attraction. This may be clearly illustrated by taking a series of small capillary glass tubes, and insert one extremity of them in a solution of sulphate of magnesia or chloride of ammonium, and break or cut off the upper extremities just below the height to which the solution rises. Expose them to the sun's rays; the water of the solution evaporates, and the fixed sulphate of magnesia will be deposited just on the upper extremity of the tube. As the solution

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on the *Food of Plants*, in January, 1848. No accurate experiments were performed, however, to fix it with a degree of certainty, till these were made which appear in this paper.

evaporates more of it rises up from below, keeping the tubes constantly full; yet no sulphate of magnesia passes off; it all, or nearly all, remains at or rises just above the evaporating surface. Just so in the soil; as the water evaporates from the surface, more water, impregnated with the soluble materials from below, rises up to supply its place. As this evaporation goes on, it leaves the fixed materials behind in the surface soil at the several points of evaporation.

"This explains why we often find, during the months of July, August and September, a crust of soluble salts covering the surface of clay deposits which are highly impregnated with the alkalies, or any of the soluble compounds of the metals, earths, or alkaline earths, also, the reason in many instances of the incrustations upon rocks that are porous and contain soluble materials. It also helps to explain the reason why manures, when applied for a short or longer time upon the surface of soil, penetrates to so slight a depth. Every agriculturist is acquainted with the fact that the soil directly under his barn-yard, two feet below the surface (that is, any soil of ordinary fineness), is quite as poor as that covered with boards or otherwise two feet below the surface in his meadow; the former having been for years directly under a manure heap, while the latter, perhaps, has never had barn-yard manure with many rods of it.

"The former has really been sending its soluble materials up to the manure and surface soil; the latter, to the surface soil and vegetation near or upon it, if uncovered.

"The capillary attraction must vary very much in different soils; that is, some have the power of elevating soluble materials to the surface from much deeper sources than others. The pores or interstices in the soil correspond to capillary tubes; the less the diameter of the pores or tubes, the higher the materials are elevated. Hence one very important consideration to the agriculturist, when he wishes nature to aid him in keeping his soil fertile, is to secure a soil in a fine state of mechanical division, and of a highly retentive nature.

"Nothing is more common than to see soils retain their fertility with the annual addition of much less manure than certain others. In fact, a given quantity of manure on the former will serve to maintain their fertility for several years; while the latter, with a similar addition, quite lose the good effects of the manure in a single season.

"The former soils have invariably the rocks, minerals, etc., which compose them in a fine state of division; while the latter have their particles more or less coarse."

The rich, clay soil contains very many small pores, while the quartz sand, and especially the coarse, sharp sand, has larger spaces, which are not properly capillary pores. Like any other small apertures and spaces, the small pores of the soil are capable of imbibing and retaining water contrary to the laws of its gravity. On the other hand, in the larger spaces or pores, the water moves entirely according to the laws of gravity. When we place a flower-pot, filled with earth, in a dish filled with water, the small or capillary pores will draw the water up, while the *larger* spacs will be filled with water no higher than they are under the surface of the water in the dish. And if we pour water upon the earth in a flower-pot, we may pour a certain quantity upon it without even a drop coming out of the hole in the bottom of the pot, simply because it is retained through capillarity in the fine pores. But when all the capillary pores are filled with water, then the water poured on will flow down the larger spaces, and, according to the laws of gravity, escape through the hole in the bottom of the pot. As the quantity and extension of the fine pores are very unequal in the different kinds of soil, the quantity of water which they are capable of absorbing and retaining through capillarity (or their "retentive power," as it is called), also varies greatly. The humus, or clay soil, retains most water; the coarse, sandy soil, least.

In order that we may be clearly understood, when speaking of the different kinds of soil, we have concluded to adopt the following classification of soils from the *Mark Lane Express:*

"The best classification of soils is a chemical classification, founded on their composition according to the proportion of sand separable by washing; it divides them into sands, sandy loams, lomas, clay loams and clays. It subdivides these again into fine and coarse sands and sandy loams, according to the size of the particles of sand, and into gravelly sands, loams and clays, according to the proportion of pebbles or fragments of rocks. The proportion of calcareous matter indicates whether they are to be called marley or calcareous sands, loams and clays; while, if they contain a certain proportion of vegetable matter, they are called vegetable soils. Each name should express some defined proportion of sand separable by washing, and of calcareous or vegetable matter. In such a classification as we advocate we should have:

"1. *Silicious soils*, containing from 90 to 95 per cent. of sand. These would be divided, on the same principle, into blowing sand, coarse sand, good agricultural sand and calcareous sand.

"2. *Loamy soils*, 70 to 90 per cent. of sand, separable by washing, subdivided into coarse sandy loam, fine sandy loam, loam, rich loam and calcareous loam.

"3. *Clayey soils*, with 40 to 70 per cent. of sand; divided into clay loam, clay and calcareous clay.

"Each of these soils termed calcareous sand, calcareous loam, etc., contain 5 per cent. of lime.

"*Marly* soils constitute a fourth group, in which the proportion of lime ranges between 5 and 20 per cent., and are divided into sandy marls, loamy marls and clayey marls.

"*Calcareous* soils contain more than 20 per cent. of lime. They are divided into sandy calcareous, loamy calcareous and clayey calcareous. While in calcareous sands, clays and loams, the proportion of lime does not exceed 5 per cent. The difference of composition denoted by difference of name is similar to the sulphates and sulphites of chemical nomenclature, which contain different proportions of sulphuric acid.

"According to the quantity of pebble fragments yielded by a square yard, or by a cubic foot of the soil, they might be denominated *gravels*, or *gravelly* sand, loams and clays.

"*Vegetable* soils vary from the common garden mold, which contain from 5 to 10 per cent. of vegetable matter to the peaty soil, in which the organic matter is about 60 to 70 per cent. They will be vegetable sands, loams, clays, marls, etc."

Now, a sandy or silicious soil will absorb 20 per cent., or one-fifth of its own bulk of water, before it is fully saturated, or the water commences to *drip* from it; a loamy soil will absorb 40 per cent., and a clayey soil will absorb from 70 to 80 per cent. The coarser non-capillary pores of the soil cannot be filled with water, unless there are impediments prohibiting the water from following its gravity; thus, in the flower-pot, only when the hole below is closed; in the arable soil, only when it is resting on or inclosed by an impervious stratum; but in a properly drained soil the water descends as regularly as in the flower-pot. Whenever the water can flow unimpeded, the larger pores are filled with air; and, as this is necessary in an arable soil, because every fertile arable soil must contain a certain quantity of air, and, to a certain extent, be in communication with the atmosphere, therefore, it follows that, in any fertile soil, the sum of the capillary pores must be in a certain proportion to the non-capillary ones, as not to exceed a certain limit, without the soil thereby assuming unfertile properties. If there is a lack of coarser pores, as, for instance, in rich clay soil; or, if the soil lacks air and communication with the atmosphere, then there will appear all the unfavorable properties characteristic of rich clay soil: wetness, coldness, a retarded decomposition of manure (inactivity), a propensity to forming acids, etc. On the contrary, if there is a lack of capillary pores in the soil, and a preponderance of the larger ones, as in a sandy soil, the soil has too little retentive power, *i. e.*, capacity of retaining water, and evaporates the little water it imbibes too soon; consequently, it is affected with drought; beside, it suffers the manuring elements to attain a state to decompose too rapidly, and allows the soluble nutriments of the plants to sink too readily with the atmospherical water into the subsoil, and the volatile nutriments to ascend, with the evaporating water, into the atmosphere. What proportion of the capillary pores to the non-capillary ones may be the most favorable in any soil, cannot now be defined, but experiments for that purpose would undoubtedly result in many interesting discoveries.

Now, if we consider the distribution of atmospherical water in the soil, we might, perhaps, be led to the supposition that the uppermost strata of the soil, through their retentive power, must retain the water falling down upon them, and give nothing to those strata lying below them; thus, that the uppermost strata must be perfectly saturated with water in the capillary way, while those lying below them, being distinctly separate, must be and remain dry.

If, *e. g.*, the retentive power of a soil is equal to fifty, (or if 100 parts of the soil are capable of retaining 50 parts of water in a capillary way), and upon this soil falls a rain in such a quantity as to give one pound of water upon every square foot of the surface, then the uppermost stratum of the soil, of about one-fourth of an inch in thickness (supposed to be perfectly dried), would completely retain the rain water in a capillary way, and the soil lying below it would receive none of it. If air is supposed to exist below the upper stratum of one fourth of an inch in thickness, then, of course, it would be as above stated, and no water would permeate; but if we have a subsoil, the attraction of this earth changes the condition of things; the upper soil does not remain saturated, but imparts to the lower one. To what degree, and to what depth? This depends upon the quality and the kind of earth. On this subject one may readily learn much by experiments. If we, for instance, put earth in a flowerpot, and pour so much water upon it as is sufficient to saturate, in the capillery way, the uppermost layer or stratum of the soil, one inch in thickness, examination of the quantity of water in the earth, at the different heights of the pot, will then show that the uppermost layer is fullest of water, but not saturated in the capillary way; the water has penetrated to a certain depth, and that the quantity of water is steadily decreasing from the top down to this depth. The way of diffusing the water depends on the chemical composition of the soil, as well as on its physical properties. The fine quartz-sand, for instance, when in a wet condition, parts with the water pretty quickly; but when perfectly dry, it possesses, like humus, especially when not completely decomposed, a repulsive property to water, so that the water has to act upon it a long time in order to produce saturation. If, therefore, after a drought of long duration, an extra quantity of rain falls upon a loamy soil and upon a fine sandy soil, after a time the water will be found to have penetrated pretty deep into the former, while in the latter only the uppermost layers are wet, but those lying below them remain in a state of dusty dryness. Thus, the loam soil, in spite of its far greater retentive power, diffuses the rain water more perfectly and deeper; but the fine sand, with its much inferior capillary power, retains it in the thin uppermost stratum. These relations become still stronger when vegetable remains, but little decomposed, are mixed with the sand. Also, the more or less pulverized state of the soil has an influence upon the capillary diffusion of water, but especially its being equally or unequally pulverized, so that usually the distribution is more perfect throughout strata which are equal in this respect, than throughout those which are unequal.

The distribution of the water, which is drawn up from below through capillary attraction, is as unequal as the different kinds of earth. If one puts flowerpots, filled with sand, loam and humus soil, in dishes of water, the absorbtion of the same will take place in a very different way; and the length of time within which the absorbed water will appear at the surface will vary very much also.

CHAPTER III.

DRAINAGE REMOVES STAGNANT WATERS FROM THE SURFACE.

From the preceding chapter it will be seen that a drained soil is necessarily more *porous* than an undrained one; consequently, when a rain falls, the water which does not immediately flow off from the surface, escapes through the pores. On an undrained soil the water becomes stagnant, because the pores are already filled with water which has no means of escape other than by evaporation. A hard impervious subsoil prevents it filtering through it, and sinking down where the roots will be uninjured by it. Furnish under-currents for the water, by means of drains, and there is no longer a necessity for the water to remain above ground, until it becomes changed from a healthful to a poisonous substance, by the continued action of heat and atmospheric air upon it.

The amount of water which may be evaporated from the surface, under the various influences which cause and control this evaporation, as well as the quantity which passes downward by means of filtration through the subsoil, or into the drains, is a matter of the greatest importance to every person engaged in the cultivalion of the soil.

Chemists assert that fully four times the amount of heat is required to convert water into vapor, that is required to bring it to the boiling from the freezing point. It is no uncommon occurrence that rain to the depth of *one inch* falls in the course [illegible] shower. The amount falling on a single acre then would amount to 360 hogsheads, and to evaporate this amount of water by sunshine, would require an amount of heat that would convert upward of 1,500 hogsheads of water from the freezing to the boiling point. Every one must know that this evaporation is a very slow process, and that while it is going on the soil is kept wet, and consequently cold; that vegetation is retarded, if not absolutely checked, especially in the early spring time. Now, if these 1,500 hogsheads of water were carried off by drains, this great amount of heat necessary to evaporate would be saved, and would be applied to warming the soil.

Some interesting facts, in relation to this subject, are furnished by Cuthbert W. Johnson, in a late number of the *Farmer's Magazine*. Observations were made for eight successive years, in Hertfordshire, and the mean amount of rain which fell, was found to be for each year 26½ inches, of which over 11 inches passed into the soil and was filtrated, and over 15 inches were evaporated from the surface. During the colder months, the amount filtrated was from three to six times as great as the quantity which passed off in the form of vapor. On the other hand, the quantity evaporated during the hottest months, was more than fifty times as great as the amount filtrated, the latter, indeed, not amounting during a whole month to the twentieth of an inch.

The greatest quantity evaporated, in a single year, was about 1,800 tuns per acre, and the greatest quantity filtrated was over 1,400.

The rate of evaporation is influenced by the amount of moisture required by the different soils for saturation, and the degree of exposure to sun and winds. Even the direction of the prevailing winds, characterized by the moisture they contain, has a material influence. Several examples are given, by which it appears that the average amount of rain at the places of observation, was about 25 inches per year; that the evaporation from *water* exposed to both sun and wind, was about 35 inches per year; shaded from the sun, but exposed to the wind, it was about 23 inches; from *soil*, when drained, about 20 inches; and from undrained soil, saturated with water, about 33 inches, an excess of 13 inches of water to be charged against an undrained soil.

These experiments were made with bare earth, free from herbage of any kind. By means of other experiments made with plants in pots, it was found that 22 square inches of surface of bare mold, evaporates in twelve days, 1,600 grains of moisture, while a pot of the same size, containing a polyanthus, evaporated 5,250 grains; showing conclusively the great rapidity with which plants carry off moisture, and the great error of those who suppose that weeds can be of any use in shading the soil.

Many persons presume that a comparatively small amount only of the water which falls in rain, on the surface of the earth, is retained by the soil, or is evaporated, but are of opinion that nearly all finds its way into rivers or smaller streams.

Some writers assert that almost the entire mass of water, from rains, is absorbed in supplying springs, and other subterranean streams. Mariotte, a celebrated French writer, has examined the point, with direct reference to whether the quantity of rain water is sufficient to feed all the springs and rivers, and so far from finding a deficiency, he concludes upon the amount being so great as to render it difficult to conceive how it is expended. According to observations which have been made, there falls annually upon the surface of the earth, about 19 inches of water; but to render his calculation still more convincing, Marriotte supposes only 15, which makes 45 cubic feet per square toise, and 238,050,000 cubic feet per square league of 2,300 toises, in each direction. Now, the rivers and springs which feed the Seine, before it arrives at the Pont-Royal at Paris, embrace an extent of territory about sixty leagues in length, and fifty in breadth, making 3,000 leagues of superficial area; by which, if 238,050,000 be multiplied, we have for the product 714,150,000,000 for the cubic feet of water which fall, at the lowest estimate, on the above extent of territory. Let us now examine the quantity of water annually furnished by the Seine. The river above the Pont-Royal, when at its mean hight, is 400 feet broad and five deep; when the river is in this state, the velocity of the water is estimated at 100 feet per minute, taking a mean between the velocity at the surface and that at the bottom. If the product of 400 feet in breadth by five in depth, or 2,000 feet square, be multiplied by 100 feet, we shall have 200,000 cubic feet for the quantity of water which passes, in a minute, through that section of the Seine above the Pont-Royal. The quantity in an hour will be 12,000,000; in a day 288,000,000; and in a year 105,120,000,000 cubic feet. This is not the *seventh* part of the water which, as previously stated, falls on the extent of country that supplies the Seine; the large remainder, not received by the river, being taken up by evaporation, beside a prodigious quantity employed for the nutrition of plants.*

Now, if this astounding calculation is true of France, what must be the condition of Ohio, and many other States where the annual rainfall is about 40 inches, or nearly three times the amount assumed by Marriotte? Think for a moment of the entire surface of Ohio being annually covered, more than a yard deep, with rain water! The autumn rains average about 10 inches, and generally thoroughly saturate the earth with water, so that when the winter precipitations take place they cannot infiltrate, or penetrate the soil—neither does evaporation take place during this period of the year; so that when spring returns the task upon the heat from the sun is not only to evaporate so much of the 10 inches of spring rain as has not flowed off by surface drainage, but the 8 inches of the winter precipitations, and much of the autumn rains—is it any wonder that the soil is not in a workable condition much before the middle of May? Think of the spring sun being obliged to evaporate about 3,000 hogsheads of water from every acre of arable soil

The following table shows the amount of rain and (melted) snow which falls at fifteen points, in different portions of the State of Ohio:

OTE.—The rainfall is stated in inches and hundredths in the columns of the respective months—thus, at Marietta the rainfall for the month of July, is 4.56 inches, or a little more than four and a half inches; for the year at the same place it is nearly 43 inches.

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* Gallery of Nature, page 263.

	Latitude.	Longitude.	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.	The Year.	Spring.	Summer.	Autumn.	Winter.		Height above Atlantic. feet.
Oberlin, Lorain Co.	41° 20′	82° 15′	1.41	1.84	1.83	3.48	3.41	4.45	3.24	3.36	3.11	2.49	3.23	1.63	33.48	8.72	11.05	8.83	4.88	Prof. Fairchilds, mean of 8 years..	800
Perrysburg, Wood county..........	41° 35′	83° 36′	2.00	1.37	2.50	4.68	3.00	8.20	9.81	2.44	7.50	2.25	7.00	4.50	55.25	10.18	20.45	16.75	7.87	Mr. Hollenbach, for year 1855 only...	610
Cleveland, Cuyahoga county.......	41° 31′	81° 46	1.71	2.33	1.20	1.92	3.08	5.28	2.33	11.05	2.67	2.84	3.91	3.55	34.33	6.20	10.37	9.42	7.58	Mean of 4 years....	650
Urbana,Champaign county..........	......	......	2.30	2.85	3.15	3.45	4.92	4.99	3.59	3.66	4.04	2.97	4.31	3.91	44.14	11.52	12.24	11.32	9.06	M. G. Williams, mean of 10 years.	
Steubenville, Jefferson county....	40° 25′	80° 40′	2.71	2.53	3.33	3.10	3.95	4.03	3.77	3.94	3.02	2.96	3.13	3.30	39.76	10.37	11.74	9.11	8.54	Roswell Marsh, mean of 26 years.	670
Germantown, Montgomery county..	39° 30′	84° 10′	2.45	3.81	3.28	3.44	4.03	3.12	3.90	3.00	2.44	2.28	3.91	3.19	38.88	10.76	10.02	8.63	9.46	L. Groneweg, mean of 5 years.......	720
Cincinnati, Hamilton county......	39° 06′	84° 30′	3.35	3.51	3.93	3.66	4.55	5.01	4.37	4.32	3.10	3.32	3.48	4.29	46.89	12.14	13.70	9.90	11.15	Ray, mean of 20 years...........	543
Portsmouth, Scioto county..........	38° 45′	82° 56′	3.00	2.90	2.90	3.20	3.90	4.50	4.40	2.70	2.40	2.90	2.80	2.60	38.20	10.00	11.60	8.10	8.50	Hempstead, mean of 15 years.........	540
Marietta, Washington county......	39° 25′	81° 31′	2.82	3.04	2.92	3.28	4.13	4.94	4.56	3.89	3.18	3.12	3.27	3.80	42.97	10.33	13.40	9.57	9.66	S. P. Hildreth, mean of 30 years......	630
COLUMBUS, Franklin county.......	......	......	....	....	....	....	....	....	....	....	....	....	....	....	48.16	10.58	16.58	11.86	9.14	Prof. Mather's MS..	
Granville, Licking county..........	......	......	2.55	3.88	3.22	3.65	3.60	5.60	4.79	3.70	2.86	3.10	4.07	4.81	45.83	10.47	14.09	10.03	11.24	S. N. Sanford, mean of 8 years.......	
Massillon, Stark county..........	......	......	1.65	1.78	1.53	1.98	3.68	5.15	3.59	2.84	2.35	2.11	3.87	2.98	33.51	7.19	11.58	8.33	6.41	J. Watson, mean of 3 years..........	
Springfield, Clark county..........	......	......	3.58	3.46	1.45	2.43	4.45	3.05	4.20	3.37	2.34	3.31	5.98	3.92	41.54	8.33	10.62	11.63	10.96	J. T. Warder, for 1857.............	
Hudson, Summit county..........	41° 15′	81° 25′	2.62	2.42	2.92	3.06	2.81	4.48	4.34	4.37	3.14	3.20	2.41	2.64	38.45	8.80	13.09	8.76	7.70	Mooney & Emerson, mean of 13 years.	1131
Lebanon, Warren county.........	......	......	4.15	2.98	5.87	4.64	2.67	3.07	7.25	3.42	2.58	3.10	2.76	4.76	47.25	13.18	13.74	8.44	11.89	For the years 1849 and 1850.........	

How much of the amount of rain which falls can be carried off by the drains, is an all-important question; and upon the answer to this question depends in a very great degree, the benefit or disadvantage of underdrainage.

The following table, copied from observations at Tharand, in Saxony, will serve to show the influence of rains on the discharge of water from drains:

	Temperature of Air.		Quantity of Rain per day, per acre, in gallons.	Discharge of Drain Water, per day, per acre, in gal'ns.	Increase, compared with the preceding day.
	Minimum.	Maximum			
1853.					
May 13	37.4	54.5	16091	1198	401
" 14	39.2	59.	——	2568	1370
June 15	50.	71.6	12105	101	——
" 16	53.	69.8	29967	1793	1692
" 17	55.4	66.2	13212	5222	3429
" 18	54.5	68.	29	5267	45
" 23	48.2	64.4	5167	2228	1405
" 24	49.	62.6	17429	10852	8624
1854.					
May 14	45.5	71.	——	38	——
" 15	51.	65.5	27754	103	65
" 16	47.5	59.	23324	9132	9029
" 29	49.	60.	27089	15919	13851
June 29	56.5	71.6	49528	15291	12230
" 30	50.	73.4	43844	15203	——
July 1	46.4	59.	8562	15708	505

In the *Journal of the Royal Agricultural Society*, vol. 5, page 151, Josiah Parkes, a celebrated land drainer in England, publishes a table, embracing observations during a space of eight years, in which he finds the amount of water *filtrated*, that is, passed into the earth and absorbed by drains, roots or plants, and retained in the soil, to vary from 36 to 57 per cent. Annexed is the table prepared by Mr. Parkes:

Years.	Rain. Inches.	Filtration. Per cent.	Evaporation. Per cent.	Rain, per acre. Tuns.
1836	31.	56.9	43.1	3139
1837	21.10	32-9	67.1	2137
1838	23.13	37.0	63.0	2342
1839	31.28	47.6	52.4	3168
1840	21.44	38.2	61.8	2171
1841	32.10	44.2	55.8	3251
1842	26.43	44,4	55.6	2676
1843	26.47	36.0	64.0	2680
Average	26.61	42.4	57.6	2695

In vol. 20, page 292, of the same journal, Mr. J. Bailey Denton, an agricultural engineer, and who is, perhaps, oftener quoted than any other agricultural engineer at the present day, shows the discharge from drains from the 1st of October, 1856, to the 31st of May, 1857, to have varied from less than one-fourth, to more than one-half of the entire rainfall during that period.

"The following observations on evaporation and filtration,* for which we are indebted to the patient and carefully conducted experiments of Mr. Charles Charnock, of Holmfield House, near Ferry-Bridge (one of the vice-presidents of the Meteorological Society of London), present some valuable facts for consideration. (pp. 80–1.)

"In these experiments, the evaporation from *saturated* soil was determined thus: 'A leaden vessel of 13 inches deep, and a foot square, was filled to within an inch of the top with soil, and placed in the ground, in the same manner as the previous vessel, with a pipe level with the surface of the soil to carry off the excess of top-water into a receiver. The same quantity of water was then daily supplied to this soil as the evaporating dish of column 2 showed was evaporated. The soil was stirred as in the former case, and thus represented wet and undrained land.'

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* Quoted by J. H. Charnock, Esq., Assistant Commissioner under the Drainage Acts, in a paper "On Suiting the Depth of Drainage to the Circumstances of the Soil," given in the *Journal of the Royal Agricultural Society*, vol. x, pt. ii, pp. 515 to 518.

An account of Observations made, through a series of five years, at Holmfield House, near Ferrybridge, in the county of York, by Charles Charnock, Esq., with a view to determine the amount of Evaporation and Filtration under the several circumstances, on the Magnesian Limestone Soil.

EXPLANATION.—Column 1, shows the Depth of Rain fallen, as registered by the ordinary Rain Gauge.

Column 2, is the Amount of Evaporation from a Surface of Water fully exposed to both Sun and Wind.

Column 3, is the Evaporation from Water shaded from the Sun, but exposed to the Wind.

Column 4, is the Evaporation from what represented drained or dry land.

Column 5, is the Evaporation from the same when saturated.

Column 6, is the Amount of Water which filtered through the soil.

Into a leaden vessel, of a foot square and three feet deep, was put two feet of gravel and calcareous sand, so as to represent the substratum of the farm, and the remainder filled up, to within an inch of the top, with an average quality of soil. At the bottom a pipe was inserted, which conveyed all the water which was filtered through into a bottle, which was regularly emptied and registered. The vessel was inserted in the ground to within an inch of the surface, keeping the level of the soil, inside and outside, alike, with an inch of the vessel above, to prevent any communication of water from without. The soil was kept freed from weeds, and occasionally stirred, that it might not be more than ordinarily compact.

MONTHS.	1842.						1843					
	Rain.	Evaporation.				Filtration.	Rain.	Evaporation.				Filtration.
	1	2	3	4	5	6	1	2	3	4	5	6
		From Water.		From Soil.				From Water.		From Soil.		
	On the surface.	Exposed to both Sun and Wind.	Shaded from Sun but exposed to Wind.	When drained.	When Saturated.	Through the Soil from the Drain 3 ft. deep.	On the surface.	Exposed to both Sun and Wind.	Shaded from Sun but exposed to Wind.	When Drained.	When Saturated.	Through the Soil from the Drain 3 ft. deep.
January..........	2.70	1.69	1.13	1.66	1.59	1.04	1.48	2.57	1.71	0.69	1.87	0.79
February..........	0.76	1.23	0.81	0.68	1.04	0.08	3,25	2.65	1.10	2.29	2.78	0.96
March............	3.48	1.92	1.28	2.40	2.52	1,08	0.95	3.05	2.03	0.72	2.43	0.23
April............	1.51	2 98	1.99	1.11	2.31	0.40	2.19	3.22	2.05	1.84	2.39	0.25
May	2.98	4.14	2.76	2.89	3.82	0.09	2.81	2.91	1.94	2.47	2 65	0.34
June	1.94	4.18	2.79	1.94	4.27	......	2.31	5.12	3.41	2.10	4.86	0.21
July	3.74	4.16	2.73	3 26	3.89	0.48	2.70	3.76	2.50	2.55	3.49	0.15
August	1.49	3.36	2.24	1.37	2.39	0.12	3.99	3.71	2.57	3.77	6.74	0.22
September	2.44	2.39	1.74	2.24	2.88	0.20	1.07	2.06	1.34	0.90	2.18	0.17
October	1.12	2.00	1.37	0 92	1.99	0.20	1.10	1.80	1.20	0.82	1.93	0.28
November	3.19	2.26	1.50	2.49	1.83	0.70	2.30	1.64	1.09	1.69	1.48	0.67
December.........	0.76	3.00	2.14	0.60	1.49	0.16	0.28	1.68	1.78	0.27	1.39	0.01
Totals........	26.11	33.61	22.48	21.56	30.02	4.55	24.49	34.17	22.72	20.11	31.10	4.28

Account of Observations—Continued.

MONTHS.	1844.						1845.						1846.					
	Rain.	Evaporation.				Fil-trat'n.	Rain.	Evaporation.				Fil-trat'n.	Rain.	Evaporation.				Fil-trat'n.
	1	2	3	4	5	6	1	2	3	4	5	6	1	2	3	4	5	6
		From Water.		From Soil.				From Water.		From Soil.				From Water.		From Soil.		
	On the Surface.	Exposed to both Sun and Wind.	Shaded from Sun, but exposed to Wind.	When Drained.	When Saturated.	Through the Soil from the Drain 3 feet deep.	On the Surface.	Exposed to both Sun and Wind.	Shaded from Sun, but exposed to Wind.	When Drained.	When Saturated.	Through the Soil from the Drain 3 feet deep.	On the Surface.	Exposed to both Sun and Wind.	Shaded from Sun, but exposed to Wind.	When Drained.	When Saturated.	Through the Soil from the Drain 3 feet deep.
January............	1.31	1.61	1.08	0.85	1.50	0.46	1.74	1.53	1.02	1.28	1.49	0.46	2.18	2.07	1.58	1.22	1.94	0.96
February...........	2.22	1.31	0.88	1.66	1.11	0.56	0.73	0.71	0.47	0.43	0.94	0.30	0.47	2.59	1.69	0.44	2.09	0.03
March	2.27	2.13	1.42	1.58	1.50	0.69	1.88	2.91	1.94	1.33	2.89	0.55	0.93	2.56	1.55	0-86	2.16	0.07
April..............	0.27	3.83	2.55	0.27	3.42	—	1.54	4.79	3.19	1.05	4.06	0.39	5.97	1.91	1.27	2.98	1.49	2.99
May	0 42	5.77	3.85	0.42	4.86	—	2.24	2.84	1.99	1.97	3.26	0.27	0.82	4.52	3.02	0.73	3.89	0.09
June...............	1.24	5.31	3.58	1.20	4.95	0.04	3.18	3.10	2.06	2.93	2.98	0.25	1 65	4.88	3.25	1.58	4.73	0.07
July	2.76	4.17	2.78	2.43	4.28	0.33	3.49	2.86	1.89	8.30	2 79	0.19	2.90	4.44	2.96	2.74	4.39	0.16
August.............	2.85	4.70	3.14	2.44	4.63	0.41	4.61	2.56	1.70	4.24	2.43	0.37	2.65	3.08	2.05	2.46	3.28	0.19
September	1.92	4.91	3.28	1.62	3.96	0.30	1.36	2.79	1.86	0.95	2.29	0.41	1.07	2.99	1.99	1.00	3.14	0.07
October	1.41	2.79	1.86	1.17	2.93	0.24	3.36	2.77	1.84	2.69	2.82	0.67	4.09	2.23	1.49	2.40	2.76	1.69
November..........	1.98	2.84	1.80	1.47	2.78	0.51	1.01	2.13	1.41	0.73	2.20	0.28	1.15	1.63	1.09	0.88	1.74	0.17
December	0.35	0.79	0.53	0.29	0.93	0.06	3.04	3.57	2.38	2.36	2.87	0.68	1.36	1.79	1.10	1.09	1.67	0.27
Totals...........	19.00	40.16	26.75	15.40	37.85	3.60	28.18	32.56	21.75	23.26	31.09	4.92	25.24	34.69	23.04	18.38	32.28	6.76

"In the first place, it is observable how much greater is the amount of evaporation from water than from land, and how near, as shown by columns 2 and 5, the evaporation from wet land is to that from water itself: hence, the wetter the land the greater the evaporation, and, as the well-known consequence, the greater its excess of coldness. We have a familiar illustration of nature's process in this particular, in the method often adopted to cool our wine on a hot summer's day, by wrapping a wet napkin round the bottle and exposing it to the full sun; as the moisture from the napkin is evaporated, the temperature of the wine declines to almost freezing point. The school-boy's experiment of producing ice before a fire, by incasing the vessel in wet flannel, and adding a portion of salt to the water, is a similar example, with this additional lesson to the farmer, that to apply certain limes to wet land is only increasing the evil.

"You will then, in the second place, notice how much less the evaporation is in the shade than in the sun, and consequently that wet land must be the warmest when there is the least sun. From which cause, no doubt, arises that too vigorous growth of young wheat, so often observable on such land in the winter and spring months, which never fails to produce serious injury to the crop in all its subsequent stages. And thirdly, you will remark how comparatively small a proportion of the rain which falls is shown to be carried off by filtration. Taking the average of the five years' experiments, it will be seen that only 4.82 inches out of 24.6 inches of rain passed through the land to the depth of three feet. We might, therefore, be led at the first glance to infer that land, in general, stands less in need of drainage, or may be drained by a less perfect system, than is supposed to be requisite, did not daily experience oppose such a conclusion. We must, therefore, endeavor to reconcile this seeming incongruity, and deduce at the same time, from the facts disclosed, such data, as may guide us in determining the essential requisites to ensure completeness of effect in drainage.

"Now, although there can be no reason to question the accuracy of the experiments on filtration made by Mr. Dickinson, and recorded in the *Journal of the Royal Agricultural Society*, of England, vol. v., part 1, yet there is very considerable difference in the aggregate result, as shown by them and the account before us. 'The first important fact disclosed,' says the commentator, page 148, 'is, that of the whole annual rain, about 42½ per cent., or 11 3-10 inches out of 26 6-10, have filtered through the soil:' whereas, in the Holmfield House experiments there is only shown, as we have already said, 4.82 inches out of 24.6, or about 5 1-10 per cent. against 42½ per cent. This is certainly a very great and somewhat irreconcileable difference in the result of two experiments made professedly to ascertain the same fact. Now, on referring to the '*Memoirs of the Literary and Philosophical Society of Manchester*,' vol. v., part 2, you will find a paper on rain, evaporation, etc., from the pen of the celebrated Dr. John

Dalton (the father of the science of meteorology), wherein he explains a series of experiments made by himself and his friend, Mr. Thomas Hoyle, jun., to ascertain the amount of evaporation and filtration, and giving the following table of results:

Months.	Water through the two Pipes.			Mean.	Mean Rain.	Mean Evaporation.
	1796.	1797.	1798.			
January	1.897	.680	1.744	1.450	2.458	1.008
February	1.778	.918	1.122	1.273	1.801	.528
March	.431	.070	.335	.279	.902	.623
April	.220	.295	.180	.232	1.717	1.485
May	2.027	2.443	.010	1.493	4.177	2.684
June	·171	.726	....	.299	2.483	2.184
July	·153	.025	....	.059	4.154	4.095
August	....	....	.504	.168	3.554	3.386
September	....	.976	....	·325	3.279	2.954
October	....	.680	....	.227	2.899	2.672
November	....	1.044	1.594	.879	2.934	2.055
December	.200	3.077	1.878	1.718	3.202	1.484
	6.877	10.934	7.379	8.402	33.560	25.158
Rain	30.629	38.791	31.259			
Evaporation	23.725	27.857	23.862			

"'Having got a cylindrical vessel of tinned iron,' says the doctor, 'ten inches in diameter, and three feet deep, there were inserted into it two pipes, turned downward for the water to run off into bottles: the one pipe was near the bottom of the vessel, the other was an inch from the top. The vessel was filled up, for a few inches, with gravel and sand, and all the rest with good fresh soil. Things being thus circumstanced, a regular register has been kept of the quantity of rain-water that ran off from the surface of the earth through the upper pipe (while that took place), and also of the quantity of that which sank down through the three feet of earth, and ran out through the lower pipe. A rain-gauge of the same diameter was kept close by, to find the quantity of rain for any corresponding time.'

"You will notice that the general result of these experiments accords, pretty nearly, with that of the Holmfield account; and yet it may be readily conceived that circumstances of situation and stratification may often occasion as wide a difference in the amount of filtration as is shown between Mr. Dickinson's and Mr. Charnock's observations.

"On an examination of the *details* registered in the account before us, it will be evident that the amount of filtration is not exclusively dependent on the fall of rain; but that a variety of other causes combine to affect its proportion. For instance, in March, April, May, June and July, of 1842, the fall of rain was 13.65 inches, and the filtration for the same period was only 2.05 inches; while in April, 1846, there was 5.97 of rain, and 2.99 of filtration. Similar instances are also noticeable in Mr. Dickinson's details. From March to October inclusve, of 1840, a fall of 11.52 inches of rain is recorded, without any filtration; but in November, 1842, the rain was 5.77, with 5 inches of filtration. Dr. Dalton's table also shows the same variations. The lesson, therefore, derivable from these experiments, so far as regards filtration by drains, is one rather of a speculative than of a definite character; for, although we are assured filtration must be secured, we are left with a large and varying margin as to the proportion. We must not, however, overlook the fact, that all the registered details show occasionally an amount of filtration nearly equal to the rain that falls, and, therefore, in determining the size of pipe to be used, the ready exit of this *maximum* quantity must be provided for."

Perhaps, the most accurate observations to determine the amount of rain carried off by drains, were made in Prussia, at Tharand, by Dr. Hugo Schober, of the Agricultural School and Experimental Farm at that place. We subjoin the following from the "*Jarbuch der Akademie zu Tharand fur* 1855."

"These experiments were made on three several tracts; two were upland, and the other was partly a garden, and partly a meadow.

"The first tract was an upland experiment field, and contained about 3½ acres.

"The second tract was an upland experiment field, and contained about 5⅓ acres.

"The third tract was part garden and part meadow, and centained about 2¼ acres.

"The drain pipe was laid at a depth of four feet in each tract, but in the first the drains were three rods apart, while in the other two they were two rods only. The fall was well adapted to test the workings of the drains; and, therefore, the minor drains were laid with 1¼ inch pipe, while the sub-main and other drains had 2¼ inch pipe.

"The first tract had 89 rods of minor, and 16 rods of sub-main, making a total of 105 rods per acre. In the 2d and 3d tracts were an average of 145 of minor, and 21 rods of sub-main, making an aggregate of 166 rods per acre of drains.

"The operations of these were in the highest degree satisfactory. These tracts are situated at an elevation of 714 French feet above the Elba, or 1028 above the North Sea. It was hazardous to grow winter crops on these tracts, on account of the excessive moisture they contained—the crops being liable to winter kill, but since they have been underdrained, are as reliable for winter crops as any other fields in the kingdom. It was the rule that it was very late in the spring, before they were in a condition to be cultivated; but since they have been underdrained, they have become workable at as early a period in the spring as any other *terrains* in the district. The crops on these tracts are remarkable for their vigor and evenness.

"So far as the annexed tabular statements are concerned, it may be necessary to state that the quantity of water from the main drain of each tract, was daily measured, regularly at 8 o'clock A. M., and 4 o'clock P M., and the hourly discharge per acre computed from this data. It is true that this method does not give the exact or precise amount, yet sufficiently so for all practical purposes. The rain-gauge was observed at 8 A. M., and 8 P. M.; the snow was melted, and the resultant water measured in the rain-gauge.

Aggregate amount of rain per acre; also the aggregate amount of water discharged by the drains; also the per cent. of rain water discharged by drains.

	Amount of Rain. Galls.	Discharge by Drains. Galls.	Per cent. of Rain water discharged.
1853.			
February	57381.2	26932.6	46
March	40840.4	71025.5	173
April	153486.2	124659.7	80
May	91546.2	53297.	58
June	173806.	69922.8	40
July	123949.4	40656.3	32
August	85667.2	1014.	1
September	136271.8	20588.6	15
October	73324.9	17073.9	27
November	44712.8	3706.8	8
December	16888.1	1224.7	7
1854.			
January	31142.	10699.9	34
February	78449.8	46381.6	59
March	61160.6	102612.9	167
April	81528.	55379.4	67
May	215545.9	91680.9	42
June	266136.7	74928.4	28
July	225024.4	183964.7	83
August	174698.3	19925.1	11
September	30159.4	1536.8	5
October	48907.8	873 2	1
November	104751.5	967.3	0.9
December	204106.	185729.2	90
1855.			
January	46678.7	61420.9	131
Aggregate from Feb. 1, '53, to Jan. 31, '54	1029656.6	440802.5	
Feb. 1, '54, to Jan. 31, '55	1537694.3	830400.8	

There are three instances only in which the drains discharge more water during the month than the amount of rain which fell during the same period; but the excess of discharge is readily explained; by reference to the table it will be observed that in each instance, during the month previous, a greater amount of rain fell than during the month in which the discharge was excessive. During the year commencing February 1, 1853, and ending January 31, 1854, the proportion of water discharged by the drains was 42 per cent. of the amount of rain; for the year ending January 31, 1855, the drainage amounted to 55 per cent. or an average for the two years of 48·5 per cent.

Average discharge per hour, per acre, of Water from the Drains.

	First Tract. Galls.	Second Tract. Galls.	Third Tract. Galls.
1853.			
February	23.5	26.6	51.3
March	59.4	66.8	161.3
April	191.4	171.5	156.4
May	47.1	51.9	115.8
June	62.7	81.5	147.1
July	45.8	46.8	71.2
August	.5	1.4	2.1
September	22.4	19.6	43 6
October	19.7	16.7	32.4
November	....	2.9	12.5
December	....	.5	4.4
1854.			
January	12.3	9.7	21.
February	58.6	47.4	100.9
March	122.2	105.7	185.8
April	57.6	89.9	83.4
May	70.9	83.1	213.
June	42.9	94.4	174.8
July	82.1	270.2	409.
August	2.4	22.3	55.6
September	0.4	0.8	5.1
October	....	....	3.5
November	0 1	0.2	3.6
December	265.1	199.2	283.9
1855.			
January	68.0	91.0	88.5
Average from February 1, 1853, to January 31, 1854	45.6	46.8	77.5
Average from February 1, 1854, to January 31, 1855	64.2	83.8	134.1
Excess in 1854	18.6	37.0	56.6

In the second table we find that the largest quantity discharged in an hour from an acre was 409 gallons; this would amount to about 156 hogsheads in 24 hours; therefore it would require two and about one-third days to drain a rainfall of one inch, or of 360 hogsheads per acre. The entire amount of the 10 inches of spring rains in Ohio would then be carried off by the drains in about 24 days, provided none of it escaped by surface drains or evaporation; but at least one half of the amount precipitated escapes by these means; it is, therefore, very certain that the drains would remove the remainder in less than twelve days.

How long would evaporation require to remove this amount of water?

It is well known that evaporation commences whenever the thermometer is above 32° F. by means of solar heat, but the winds very often evaporate or "dry up" more moisture than the warmest summer day.

The evaporation from a reservoir surface at Baltimore, during the summer months, was assumed by Colonel Abert to be to the quantity of rain as two to one.

Dr. Holyoke assigns the annual quantity evaporated at Salem, Mass., at 56 inches; and Colonel Abert quotes several authorities at Cambridge, Mass., stating the quantity at 56 inches. These facts are given by Mr. Blodget, and also the table below:

Quantity of Water evaporated, in inches, vertical depth.

	Jan.	Feb.	Mar.	Apr.	May.	June.	J'y.	Aug.	Sept.	Oct.	Nov.	Dec.	Year.
Whitehaven, Eng., mean of 6 years.	0.88	1.04	1.77	2.54	4.14	4.54	4.20	3.40	3.12	1.93	1.32	1.09	30.03
Ogdensburg, N Y., 1 year	1.65	0.83	2.07	1.63	7.10	6.74	7.79	5.41	7.40	3.95	3.66	1.15	49.37
Syracuse, N. Y., 1 year	0.67	148	2.24	3.42	7.31	7.60	9.08	6.85	5.33	3.02	1.33	1.86	50.20

The quantity for Whitehaven, England, is reported by J. F. Miller. It was very carefully observed, from 1843 to 1848—the evaporation being from a copper vessel, protected from rain. The district is one of the wettest of England—the mean quantity of rain, for the same time, having been 45.25 inches.*

If, then, the atmosphere of Ohio has the evaporating capacity of that of Ogdensburg, N. Y., it would require the entire months of March, April and May to evaporate the amount of spring rains—that is, if none of the precipitation escaped by filtration or surface drainage; or, in other words, underdrains will accomplish in 24 days the same removal of water for which evaporation requires 92 days.

A few of the more obvious advantages of draining over evaporation may be briefly enumerated thus:

In undrained ground the season of growth is shortened by the time occupied in evaporation, always a long and tedious process. In drained lands, on the contrary, much time is gained, not only by permitting an earlier working, but in the better adaptation of the ground to germination. In undrained ground the water, passing off in the form of vapor, carries with it a certain quantity of the latent heat of the earth, and this heat is in proportion to the amount of vapor formed. Thus, the land is left colder than it was when covered or saturated with water, and by so much germination is retarded. But in land properly drained the water passes off without being converted into vapor. The temperature of the land at the surface remains the same, and the temperature of the subsoil, through which the water passes, becomes as warm as the surface. Thus

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* French on Farm Drainage.

YEAR 1854.	Winter.			Spring.		
	Dec.	Jan.	Feb.	Mar.	Ap'l.	May.
Rain fall in Prussian cubic inches on 1 sq. foot Prussian, at Gorlitz	61.74	181.15	376.43	180.50	138.02	411.57
Drain water in Prussian cubic inches, on 1 Prussian sq. foot land:						
I. Gorlitz, experimental boxes. 1, clay soil	......	......	168.8	115.9	......	3.6
2, loam soil	......	......	9.5	299.6	30.6	9.6
3, loamy sand soil	......	......	3.4	295.2	16.7	6.8
II. Moholz, A, loam soil	35.78	62.42	333.13	319.34	68.49	33.67
B, loamy sand soil	29.59	51.27	292.29	297.86	76.54	43.69
III. Kuestner's plan: clay, loam, sand	......	......	......	......	......	......
Average of the six Silesian stations	13.07	22.74	161.42	265.58	28.47	19.47
Drain water in per cent. of rain:						
I. Gorlitz, experimental boxes. 1, clay soil	......	......	49.36	64.21	......	0.27
2, loam soil	......	......	2.5	165.98	22.17	2.33
3, loamy sand soil	......	......	0.9	163.55	12.10	1.65
II. Moholz, A, loam soil	57.95	34.46	88.5	176.92	49 62	8.18
B, loamy sand soil	47.93	28.3	77.65	165.02	55.46	10.61
III. Kuestner's plan: clay, loam, sand	......	......	......	......	......	......
Average of the six Silesian stations	21.17	12.25	43.78	147.14	27.87	4.73

the depth of heated earth is increased, and the surface is less liable to be affected by change of temperature.

In evaporation, organic and mineral matters, in the form of gases, pass off with the vapor, thus leaving the ground poorer; while in filtration, accomplished by draining, these substances become fixed in the earth for the nourishment of the future plant.

Undrained lands suffer from hot and dry weather. For, though there may be water within a few inches of the surface, the ground becomes so compact and baked that it is not sufficiently porous to draw up moisture. Drained land, on the other hand, is open to the action of the atmosphere to a great extent; it becomes finely comminuted, the hard pans and stiff clays are broken up and rendered sufficiently porous to imbibe water from below; and also, having a greater surface exposed to the air, it receives more moisture in the form of dew.

In winter and spring, wet land heaves up, under the influence of frost and heat, thus exposing such grains as have been planted directly to the weather; for this reason wheat and other grains are liable to winter-kill, and, instead of them, spring up wild grasses and noxious weeds. Draining, to a greater extent, prevents this. When land is dry, the variations it experiences under unequal temperatures are very slight, compared with the changes produced by the same variations on wet land. The result of extreme heat and extreme cold is to increase the bulk of water to a considerable extent. This expansion on the surface of the ground is seen in little hillocks, with cracks running in all directions. By the evaporation of moisture from this frozen ground, many particles of earth are left

Summer.			Fall.			Winter.	Spring.	Summer.	Fall.	YEAR 1864.
June.	July.	Aug.	Sept.	Oct.	Nov.					
657.74	472.53	611.37	116.59	120.68	375.34	619.32	730.09	1741.64	612.61	3703.66
9.6	153.8	80.9	..	..	30.9	168.8	119.5	244.3	30.9	563.5
516.9	188.6	112.3	6.2	2.3	60.2	9.5	339.8	817.8	68.7	1235.8
360.4	266.0	70.6	..	1.3	26.1	3.4	318.7	697.0	27.4	1046.5
140.52	311.27	143.61	72.86	29.54	136.20	431.33	431.50	595.40	238.60	1686.83
134.22	337.85	216.30	107.26	42.95	189.95	373.15	418.09	688.37	340.16	1819.77
9.39	37.94	2.26	0.09	..	0.69	..	..	49.59	0.78	..
195.17	215.91	104.33	31.07	12.68	74.01	164.36	323.52	515.41	117.76	1270.5
1.46	32.55	13.23	..	..	8.23	30.16	16.37	14.0	5.0	15.0
78.59	39.91	18.37	5.33	1.91	16.04	1.53	46.55	47.0	11.2	33.4
54.79	56.29	11.55	..	1.08	6.95	0.55	43.66	40.0	4.4	28.3
21.36	65.87	23.49	62.49	24.48	36.29	69.65	58.42	34.2	38.9	45.6
20.41	71.50	35.38	92.	35.59	50.61	60.28	57.26	39.5	55.5	49.2
1.43	8.03	0.37	0.08	..	0.18	..	..	2.8	0.1	..
29.67	45.69	17.06	26.65	10.51	19.71	32.43	44.32	29.6	19.2	34.3

unsupported and fall, thus leaving the tender roots exposed to the weather when protection is most needed.

Messrs. Waege and Von Mollendorf, of Gorlitz, Prussia, have published, in the *Zeitschrift fur Drainirung*, No. 23, 1855, a series of observations on the discharge of drain water from different kinds of soil. They employed the Dalton apparatus for percolation. The experimental boxes were filled to the depth of four feet of soils taken from fields in which drains were placed at the same depth. These boxes contained respectively:

I. Box No. 1, a clay soil, consisting of 88 per cent. of clay and 12 per cent. of sand; box No. 2, loamy soil, 41·7 per cent. of clay, humus, etc., 58·3 per cent. sand; box No. 3, a loamy sand soil, 19·2 per cent. of clay, humus, etc., 80·8 per cent. sand.

II. The soil in the system A, of the *Moholz estates*, is loamy soil, corresponding to that of box No. 2; in the system B, loamy sand soil, corresponding to that of box No. 3.

III. The plan of *Kuestner*, on the field of Gorlitz. The drains have, with a very cloddy (much cut) ground, a fall of 18¾ inches to 10 perches. They are 4 feet deep and 4 perches apart. The soil consists alternately of strata of clay, of loam and of gravel, and corresponds on an average with No. 3 of the experimental boxes.

The corresponding observations of the depth of rain were made at Gorlitz.

The monthly average, derived from daily observations, for the meteorological year 1854 (Dec. 1, 1853—Dec. 1, 1854), are given in the first table on pp. 456–57.

Influence of the kind of soil on the quantity of drained water.—In confirmation of former observations the loamy soil drained the largest amount of water of the three different kinds of soil employed in the Gorlitz experimental boxes. The results at Tharand were similar. The mouth of the main drain of the third part of the estate at that place—being loamy soil—discharged, in monthly average, 309·9 cans per acre per hour; while the mouths of the first and second division—in clay soil—yielded only 182·4 and 187·3 cans, respectively. The drain water, according to the measurements in the apparatus at Gorlitz, amounts to 15 per cent. of rain water in the clay soil, and 33·4 per cent. in the loamy soil. Supposing the falls, etc., to be equal, the same capacity of pipes would suffice for about two acres of clay soil that is required for one acre of loamy soil (also loamy sand soil).

*Influence of the season on the discharge of water.**—These observations are in harmony with the former observations at Tharand, and also agree with the *average* of the Silesian stations, inasmuch as the drains in *spring* flow strongest, compared with the quantity of rain water (44·3 per cent. of the rain water). The least discharge took place, on an *average*, in *fall*—thus deviating from former observations at the Gorlitz boxes, and agreeing with the observations at Tharand. Quite considerable deviations, however, occur sometimes, which can be explained only by continued and increased observations.

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* The discharge is, according to *John*, changed according to the *time of day*. A comparison of the observations made, three times a day, by Gropp, at Isterbies, 1852, resulted as follows:

	Number of Observations.	Morning. Prussian quarts.	Noon. Prussian quarts.	Evening. Prussian quarts.
February	29	1848	1828	1810
March	31	1163	1160	1149
April	30	826	821	823
May	31	1205	1206	1193
June	30	592	537	532
July (first half)	15	13½	12 3-5	12 3-5
In the 5½ months	166	5647½	5564 3-5	5519 3-5
Average	....	5577 quarts of drain water.		

Time in which drain water arrives at the pipes in various kinds of soil.—The following table, from the Gorlitz boxes, is confirmed by numerous experiments:

	No. of rainy days.	The Drains discharged.				The Drains were humid.			
		No. 1.	No. 2.	No. 3.	Average No. of days.	No. 1.	No. 2.	No. 3.	Average No. of days.
December	....	....	....	....	....	....	....	....	....
January	....	....	....	....	....	....	....	....	....
February	22	2	4	4	3	3	5	3	4
March	17	6	11	11	9	2	2	3	2
April	7	....	3	2	2	1	3	2	2
May	13	2	3	4	3	9	6	8	8
June	20	5	26	22	18	22	3	7	11
July	9	15	16	16	16	9	5	8	7
August	21	10	12	8	10	4	....	2	2
September	9	....	3	....	1	4	2	2	....
October	14	....	1	....	....	....	1	....	....
November	21	9	16	9	11	7	5	8	7
In 1854	153	49	95	76	73	61	32	41	45
May to Nov., 1863	104	84	106	118	103	53	27	10	30

There were discharged, during 166 observations in the morning, 127 9-10 quarts more than in the evening; these observations show a discharge for the 166 days greater, by 184,176 quarts, or 6,821 cubic feet, than the evening observations.

This disproportion, according to *John*, must be explained partly by the smaller amount of evaporation during the night, and partly by the fact that the rainfall during the day (which, perhaps, exerts a greater influence on the discharge of water from the drain pipes the next morning than the *immediately* preceding night rain), seem to exceed the rainfall during the night (at Crefeld the ratio of night rain to the day rain was as 159·28 to 181·6 in the years 1850–'54). The influence of the time of day is to be taken in consideration for the observations of the quantities of drain water; if an observation for three times a day cannot be made, the noon time should be preferred, as its results come nearest to the average, according to the table.

In the clay soil No. 1, as compared with the sand soil No. 2, and the loamy sand soil No. 3, the drain was flowing the least number of days, but kept humid the longest.

Condition of moisture of the soil.—With regard to the question, whether draining might not dry too much, experiments were made again in the boxes, in a depth of two feet, at a time when the drains had just ceased to carry away water. The contents of moisture amounted to:

	In clay soil. Per cent.	In loam soil. Per cent.	In loamy sand soil. Per cent.	In the average of the three kinds of soil.
On May 6, 1854	18.6	20.	20.9	19.8
September 5, 1854	18.5	19.	19.5	19.
May and August, 1853	20.5	19.3	15.6	18.5
October and November, 1853	20.5	18.5	14.	17.6

Permanent moisture has, therefore, in heavy soil, diminished since 1853, perhaps owing to an increase of drying crevices, and it has considerably increased in lighter soil, perhaps owing to its having become more compact.

The above-mentioned *V. Mollendorf* has, beside, published a ***summary comparison of the quantities of rain and drain water according to German and English observations***, with the remark that the German measurements (which are not specified), that served for computation, had been made at Tharand (Saxony), Gorlitz, Moholz, Grosskrauscha, Deutsch Paulsdorf, Ullersdorf (all of them in Silesia), and at Suisheim (Baden).—(*Wilda, Centralblatt*, 1856, I, No. 14.) *See table on p.* 461.

These figures, on the whole, confirm the conclusions drawn from the investigations made in common with *Waege;* the difference between the discharge of drain water of loam soil and loamy sand soil, and that of clay soil, is found to be less considerable.

The atmospheric precipitations of a large aggregate of ponds, ditches, and other works, on a surface of 1·43 geographical square miles, near Leipsic, are collected and employed as spring water in the mining districts. The water is measured every week by the rotations of the water wheel. If we compare the discharge of water computed therefrom, with the rains from 1830–'51, the result shows that there has been an annual average (during these 22 years) of rain equal to 24·55 Prussian inches.

In spring,	61·8	per cent.	(64·73.)
" summer,	31·1	"	(36·82.)
" fall,	39·5	"	(27·84.)
" winter,	76·7	"	(37·4.)
In the year,	47·7	per cent.	(41.64.)

Observation.—The figures in parentheses—average per cent. of the rain water discharge by drains according to German observation.

	Spring.				**Summer.**				**Fall.**				**Winter.**				Total Year.
	Mar.	Ap'l	May.	Total.	June.	July.	Aug.	Total.	Sept.	Oct.	Nov.	Total.	Dec.	Jan.	Feb.	Total.	
A. CLAY SOIL.																	
German observations.																	
Rainfall, - - Prus. inches,	1·31	2·20	3·22	6·73	4·48	3·97	3·52	11·97	2·01	1·54	1·58	5·13	2·48	1·21	1·95	5·64	29·47
Disch'ged drain water, "	1·87	1·41	0·97	4·25	0·99	1·68	0·67	3·34	0·37	0·63	0·38	1·38	1·24	0·24	1·02	2·5	11·47
Drain water, pr c. of rainfall,	142·7	62·3	30·2	63·2	22·1	42·3	19·	27·9	18·4	40·9	24·	2,·9	50·	19·8	52·3	44·3	38·9
B. LOAM SOIL.																	
a. English observations.																	
Rainfall, - - Prus. inches.	1·57	1·41	1·81	4·79	2·15	2·22	2·36	6·73	2·56	2·74	3·73	9·03	1·68	1·79	1·92	5·39	25·94
Drain water, " "	1·05	0·29	0·11	1·45	0·04	0·04	0·03	0·11	0·36	1·36	3·16	4·88	1·76	1·26	1·5	4·02	10·96
Drain water, pr c. of rainfall,	66·6	21·	5·9	30·3	1·8	1·9	1·5	1·7	14·	49·6	84·9	54·1	104·6	70·4	78·5	83·9	42·3
b. German observations.																	
Rainfall, - - Prus. inches,	1·35	1·81	3·05	6·21	4·25	3·73	3·75	11·73	2·	1·33	1·81	5·14	3·06	1·21	1·98	6·25	29·33
Drain water, " "	2·34	1·3	1·61	5·25	1·77	2·27	1·04	5·18	0·52	0·53	0·39	1·44	2·	0·43	0·9	3·34	15·21
Drain water, pr c. of rainfall,	173·3	71·8	52·8	84·5	41·6	63·5	27·7	44·2	26·	39·9	21·5	28·	65·7	35·5	45·4	53·4	51·9
C. LOAMY SAND SOIL.																	
German observations																	
Rainfall, - - Prus. inches,	1·35	1·16	2·68	5·19	3·7	3·41	3·83	10·94	2·12	1·31	1·59	5·02	2·42	1·12	1·98	5·52	26·67
Drain water, " "	1·23	0·51	0·51	2·25	1·38	2·07	0·86	4.31	0·63	0·65	0·16	1·44	0·55	0·	0·43	0·98	8·98
Drain water, pr c. of rainfall,	91·1	44·	19·	43·4	37·3	60.7	22·5	39·4	29·7	49·6	10·1	28·7	22·7	0·	21·7	17·7	33·7
D. LIMY SOIL.																	
English observations.																	
Rainfall, - - Prus. inches,	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	23·88
Drain water, " "	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	4·68
Drain water, pr c. of rainfall,	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	19·6
Average from Ger. obs.:																	
Rainfall, - - Prus. inches,	1·34	1·72	2·98	6·04	4·14	3·7	3·7	11·54	2·04	1·4	1·66	5·1	2·65	1·18	1·97	5·8	28·48
Drain water, " "	1·81	1·07	1·03	3·91	1·71	2·01	0·85	4·26	0·51	0·6	0·31	1·42	1·27	0·22	0·78	2·27	11·86
Drain water, pr c. of rainfall,	135·	62·2	34·57	64 73	41·3	59·9	23·	36·82	25.	42·57	18·7	27·84	47·54	18·64	39·6	37·4	41·64

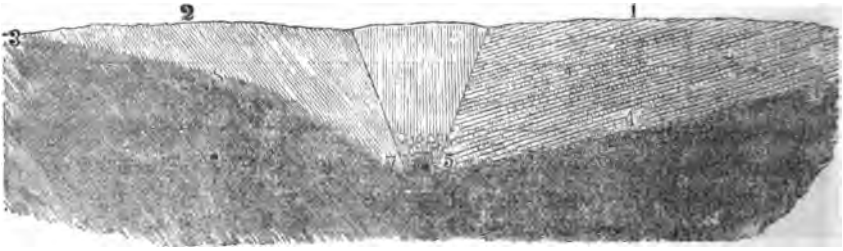
The excess of drain water over rain water prevailing in the German observations, in the first spring month, or March, is probably caused by the circumstances that this month must remove the meteorical precipitations of the winter months, collected in the form of ice and snow; a circumstance which does not occur in England with its milder winter. The difference between the discharge of the drains in England and Germany during the summer is to be accounted for by the prevalence of the summer rains in the German climate; the fact that autumn furnishes more rain in England than in Germany, is in consequence of the prevalence of the fall rains in the English climate, and of the cloudy quality of its fall atmosphere, which retards evaporation.

CHAPTER IV.

DRAINAGE REMOVES SURPLUS WATER FROM UNDER THE SURFACE.

There is a body of stagnant water below the surface of the ground, as those who work clayey soils will not have failed to observe. This water sometimes settles in the bottom of the furrows, even when the surface of the land was sufficiently dry to work. In porous soils this body lies at a great depth, but in clayey soils usually within a foot or two of the surface, and is known among drainers as the "water line." This body of water not only saturates the soil, and consequently excludes the *air*, whose presence, on a previous page, we have shown to be very necessary, but it keeps the soil cold and retards vegetation. In the words of Dr. Hobbs, quoted by Judge French, in his admirable treatise on "Farm Drainage," "A knowledge of the depth to which this water table should be removed, and of the means of removing it, constitutes the science of draining."

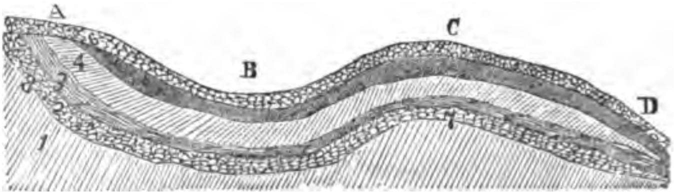
In the annexed engraving (Fig. 3), suppose the right-hand portion, 1, to represent a loamy soil, and the left-hand portion, 2, a heavy clayey soil If in the clayey soil a drain be sunk to 7,5, the water table will ordinarily assume the direction 3,8,7, when the drain commences to act, leaving that portion of the soil indicated by the lighter shade, 2,3,8,7, in good workable



[FIG. 3.]

condition, and ready to supply nutriment to the roots of plants; while in a loamy soil the direction will be 5.4.f. In other words, the table at 3 will not sink to a level with 7 as rapidly as from 1 to 5. Hence, in clayey soils the drains should either be deeper or closer together, to effect the same object as in loamy soils.

This ground water arises from several causes, viz: There may be an impermeable or impervious strata at a comparatively short depth from the surface, which will not permit the waters from the rains to pass through it, as at 5, Fig. 4. Suppose the contour of the surface of a field to be represented by A, B, C, D, Fig. 4, and 5 is a stratum of impervious clay; 4, a stratum of "*hard pan*," or blue clay; and 3 a stratum of compact white clay, resting on a stratum, 2, of sand or gravel; and this last on an impervious bed, 1. It is very evident that all the rains falling from A to C will collect from the surface at B, while that which penetrates the soil will flow along the top of the stratum, 5, until it reaches the lowest point under B; consequently, at B there will be a swamp or morass. Even should the surface water from the rain be evaporated, the swamp would still be supplied with water inherent in the strata from A to C. A well sunk at C into the gravel at 7 would be well supplied with water, because 2, being a water-bearing stratum, would receive its supply from below A, and 5, being an impervious stratum, would not permit water to escape at B; but a well sunk at B, into the stratum 2, would seriously affect the well at C, and perhaps "dry it up;" at E there would be springs, swamp or morass, according to the nature of the ground. In this case, the ground water, or *water of pressure*, as Judge French terms it, is that which is found in strata 4 and 5.



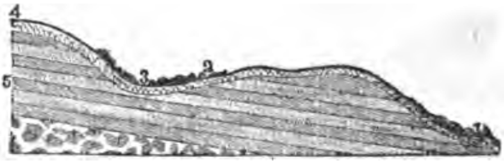
[Fig. 4.]

There may be a nice distinction in law, and, perhaps, in *very* scientific treatises on drainage, between ground water and springs; yet, for all practical purposes, so far as drainage is concerned, they amount to about the same thing—for the reason that the great object of drainage is to cut off this supply of superabundant subterranean water—derived originally, no doubt, from the same source. And the only difference which really can exist is this, viz: a spring is a body of subterranean water, *collected* in a reservoir, and flowing from thence in a larger or smaller stream; while the ground water is a body of subterranean water *diffused* throughout the strata, and, when collected and discharged by drains, is as much spring water as if nature herself discharged it in the form of a regular spring.

The strata beneath the soil are not always conformable to the surface, as those in Fig. 4, but frequently lie nearly level with the horizon, or making but a small angle with it, while the surface itself may be full of undulations. In illustration of the formation of springs and the action of rain on such a district or region of country as represented by Fig. 5, we copy from *Morton's Cyclopedia of Agriculture:*

" When rain falls on a tract of country, part of it flows over the surface, and makes its escape by the numerous natural and artificial courses which may exist, while another portion is absorbed by the soil and the porous strata which lie under it.

" Let the following diagram represent such a tract of country, and let the dark portions represent clay or other impervious strata, while the lighter portions represent layers of gravel, sand or chalk, permitting a free passage to water.

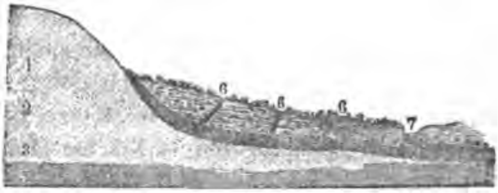


[FIG. 5.]

" When rain falls in such a district, after sinking through the surface layer (represented in the diagram by a narrow band), it reaches the stratified layers beneath. Through these it still further sinks, if they are porous, until it reaches some impervious stratum, which arrests its directly downward course, and compels it to find its way along its upper surface. Thus, the rain which falls on the space represented between 2 and 4, is compelled, by the impervious strata, to flow toward 3. Here it is at once absorbed, but is again immediately arrested by the impervious layer 5: it is, therefore, compelled to pass through the porous stratum 3, along the surface of 5 to 1, where it pours forth in a fountain, or forms a morass or swamp, proportionate in size or extent to the tract of country between 2 and 4, or the quantity of rain which falls upon it. In such a case as is here represented it will be obvious that the spring may often be at a great distance from the district from which it derives its supplies; and this accounts for the fact, that drainage works on a large scale sometimes materially lessening the supply of water at places remote from the scene of operations.

" In the instance given above, the water forming the spring is represented as gaining access to the porous stratum, at a point where it crops out from beneath an impervious one, and as passing along to its point of discharge at a considerable depth, and under several layers of various characters. Sometimes, in an undulating country, large tracts may rest immediately upon some highly porous stratum, rendering the necessity for draining less apparent; while the adjoining parts of the country may be full of springs and marshes, arising partly from the rain itself, which falls in these latter districts, being unable to find a way of escape, and partly from the natural drainage of the more porous soils adjoining being discharged upon it.

"Again: the higher parts of hilly ground are sometimes composed of very porous and absorbent strata (1, 2, 3, Fig. 6), while the lower portions, 4, 5, are more impervious, the soil and subsoil being of a very stiff and retentive description. In this case, the water collected by the porous layers is prevented from finding a ready exit, when it reaches the impervious layers, by the stiff surface soil The water is by this means dammed up, in some measure, and acquires a considerable degree of pressure, and, forcing itself to the surface at various places, it forms those extensive "weeping" banks, as at 6, 6, 7, which have such an injurious effect upon many of our mountain pastures. This was the form of spring or swamp, to the removal of which Elkington principally turned his attention; and the following diagram, taken from a description of his system of draining, will explain the stratification and springs referred to more clearly:



[FIG. 6.]

Fig. 6, although copied from *Morton's Cyclopedia of Agriculture*, was, in all probability, an ideal section, yet it is a correct representation of a portion of the country between Canton and Massillon, in Stark county. About three miles west of Canton the railroad passes through what is familiarly known in the locality as Buck's Hill, composed of drift (sand and gravel), as represented at 1, 2, 3; this drift rests upon another drift formation, "hard pan," or blue clay, 5. Wells in the immediate vicinity of the hill have been sunk 66 feet, in pure sand and gravel, before reaching the stratum, 5. Originally (in 1800, up to 1818), most of the land lying along the line of railroad, from the bed of the Nimishillen, 7, for a mile or more toward the hill, was a perfect morass, as represented in the figure; but occasional open drains and wells have now rendered it good arable land, although, in the immediate vicinity of the creek, evidences of the former marshy condition yet remain.

The precise *quantity* of water *required* for the agricultural purposes of any district depends upon the nature of the soil and the crops, and the position of the district in relation to the surrounding country. Thus, if a permeable soil occupy an elevated site, the water deposited upon it will pass rapidly, and, perhaps, before serving for the germination or nutriment of the plant. If, on the other hand, as is the far more common case in this country, the soil be of a retentive character, and the site low in relation to other districts, the water will be kept while the soil becomes saturated to so great an extent, that the processes of vegetable germination and growth are greatly impeded. The soil exists in one of three conditions: 1. In the form of clay, being a dense mass of finely comminuted particles, but all of a highly tenacious kind; in a state of slight moisture, it becomes a clammy paste, and is never found so utterly devoid of moisture that its constituent particles are separable; it affords no passages for water, receiving it with difficulty, and retaining it in the same way. 2. In the form of sand or gravel, the particles of which are seldom or never united, and the soil is, therefore, full of passages or canals for water. Soil of this kind has no power either to oppose the admission or effect the retension of water poured upon it. And, 3. Existing in the form of a mixture of the aluminous, silicious, and calcareous elements, in endless variety of proportions, found as *clods*, and in this state affording two classes of passages for the ingress and permeation of water, viz: those remaining between the particles which are congelated in each clod, and those formed by the spaces between the clods. The former are sometimes called *pores*, the latter *canals*. The power of admitting and retaining or discharging water, exerted by these mixed soils, will exist in an endless variety of degrees, according to the mechanical formation of the constituent particles and clods. The state of soil which is most favorable for the germination and development of the plant, is that of *moistures*, capable of being readily crumbled by the hand, and equally removed from the adhesive extreme of *mud*, and the volatile one of *dust*. In this condition it will be found that the *pores* are filled with water, but the *canals* are not—these latter serving as passages of air, which is one of the feeders of vegetable life; and we can, therefore, readily understand that, when water exists in such quantity that the soil is saturated and all the pores or canals filled, its condition is unhealthy for the growth and development of plants.

The following extract from an admirable lecture on agricultural science, by Dr. Madden, quoted by the General Board of health in their "*Minutes of Information*," although of considerable length, claims a space here, for the valuable information it conveys on the fitness of soil for promoting vegetable germination:

"The first thing which occurs after the sowing of the seed is, of course, *germination;* and before we examine how this process may be influenced by the condition of the soil, we must necessarily obtain some correct idea of the process itself. The most careful examination has proved that the process of germination consists essentially of various chemical changes, which require, for their development, the presence of air, moisture, and a certain degree of warmth. Now it is obviously unnecessary for our present purpose, that we should have the least idea of the nature of these processes; all we require to do is to ascertain the conditions under which they take place; having detected these, we know at once what is required to make a seed grow. These, we have seen, are air, moisture, and a certain degree of warmth; and it consequently results, that whenever a seed is placed in these circumstances, germination will take place. Viewing matters in this light, it appears that soil does not act *chemically* in the process of germination; that its sole action is confined to its being the vehicle by means of which a supply of air, and moisture, and warmth can be continually kept up. With this simple statement in view, we are quite prepared to consider the various conditions of soil, for the purpose of determining how far these will influence the future prospects of the crop, and we shall accordingly at once proceed to examine, carefully, into the *mechanical relations of soil.*

"Soil, examined mechanically, is found to consist entirely of particles of all shapes and sizes, from stones and pebbles, down to the finest powder; and on account of their extreme irregularity of shape, they can not be so close to one another as to prevent there being passages between them, owing to which circumstance soil in the mass is always more or less *porous.* If, however, we proceed to examine one of the smallest particles of which soil is made up, we shall find that even this is not always solid, but is much more frequently *porous*, like soil in the mass. A considerable portion of this finely divided part of soil, the *impalpable matter*, as it is generally called, is found, by the aid of the microscope, to consist of *broken down vegetable tissue,* so that when a small portion of the finest dust from a garden or field is placed under the microscope, we have exhibited to us particles of every variety of shape and structure, of which a certain part is evidently of vegetable origin.

"On examining a *perfectly dry* soil, we perceive that there are two distinct classes of pores: 1. The large ones, which exist between the particles of soil; and, 2. The very minute ones, which occur in the particles themselves; and, whereas, all the larger pores, those between the particles of soil, communicate most freely with each other, so that they form canals, the small pores, however freely they may communicate with one another in the interior of the particle in which they occur, have no direct connection with the pores of the surrounding particles. Let us now, therefore, trace the effect of this arrangement. If the soil is *perfectly dry,* the canals communicating freely at the surface with the surrounding atmosphere, the whole of these canals and pores will, of course, be filled with air. If, in this condition, a seed be placed in the soil, you at once perceive that it is freely supplied with air, *but there is no moisture;* therefore, when soil is *perfectly dry*, a seed cannot grow.

"Let us turn our attention now to that state of the soil in which water has taken the place of air, or, in other words, the soil is *very wet.* If we observe our seed now, we find it abundantly supplied with water, but *no air.* Here again, therefore, germination cannot take place. It may be well to state here, that this can never occur exactly in nature, because water has the power of dissolving air to a certain extent; the seed is, in fact, supplied with a certain amount of this necessary substance; and owing to this, germination does take place, although by no means under such advantageous circumstances as it would were the soil in a better condition.

"We pass on to a different state of matters. Let us suppose the canals are open, and freely supplied with air, while the pores are filled with water. While the seed now has quite enough of air from the canals, it can never be without moisture, as every particle of soil which touches it is well supplied with this necessary ingredient. This, then, is the proper condition of the plant for germination, and, in fact, for every period of the plant's development; and this condition occurs when the soil is *moist*, but not *wet*—that is to say, when it has the color and appearance of being well watered, but when it is still capable of being crumbled to pieces by the hands, without any of its particles adhering together in the familiar form of mud.

"Let us observe still another condition of soil: In this instance, as far as water is concerned, the soil is in its healthy condition—it is moist, but not wet, the pores alone being filled with water. But where are the canals? We see them in a few places, but in, by far, the greater part of the soil none are to be perceived; this is owing to the particles of soil having adhered together, and thus, so far, obliterated interstitial canals, that they appear only like pores. This is the state of matters in every *clod of earth;* and you will at once perceive, on comparing it with a stone, that it differs from it only in possessing a few pores; which latter, while they may form a reservoir for moisture, can never act as vehicles for the *food* of plants, as the roots are not capable of extending their fibres into the interior of a clod, but are at all times confined to the interstitial canals.

"With these four conditions before us, let us endeavor to apply them *practically*, to ascertain when they occur in our fields, and how those which are injurious may be obviated.

"The first of them is a state of too great dryness, *a very rare* condition, in this climate at least; in fact, the only case in which it is likely to occur is in very coarse sands, where the soil, being chiefly made up of pure sand and particles of flinty matter, contains comparitively much fewer pores, and, from the large size of the individual particles, assisted by their irregularity, the canals are wider, the circulation of air freer, and, consequently, the whole is much more easily dried. When this state of matters exists, the best treatment is to leave all the stones which occur on the surface of the field, as they cast shades, and thus retard the evaporation of water.

"We will not, however, make any further observations on this very rare case, but will rather proceed to much more frequent, and, in every respect, more important condition of soil—an *excess of water.*

"When water is added to perfectly dry soil, it, of course, in the first instance, fills the interstitial canals, and from these enters the pores of each particle; and if the supply of water be not too great the canals speedily become empty, so that the whole of the fluid is taken up by the pores; this, as we have already seen, is the *healthy* condition of soil. If, however, the supply of water be too great, as is the case when a spring gains admission into the soil, or when the sinking of the fluid through the canals to a sufficient depth below the surface is prevented, it is clear that these also must get filled with water so soon as the pores have become saturated. This, then, is the condition of *undrained soil.*

"Not only are the pores filled, but the interstitial canals are likewise full; and the consequence is, that the whole process of the germination and growth of vegetables is materially interfered with. We shall here, therefore, briefly state the injurious effects of an excess of water, for the purpose of impressing more strongly on your minds the necessity of thorough draining, as the first and most essential step toward the improvement of your soil.

"The *first* great effect of an excess of water is, that it produces a corresponding diminution of the amount of air beneath the surface, which air is of the greatest possible consequences in the nutrition of plants; in fact, if entirely excluded, germination would not take place, and the seed sown would, of course, either decay or lie dormant.

"*Secondly*, an excess of water is most hurtful, by reducing considerably the *temperature* of the soil; this I find, by careful experiment, to be to the extent of 6½ degrees Fahrenheit, in summer, which amount is equivalent to an elevation above the level of the sea of 1,950 feet. So that, supposing two fields lying side by side, the one drained, the other undrained, and supposing them both equally well cultivated, there will be nearly as much difference in the amount and value of their respective crops, as if the drained one was situated at the level of the sea, and the other had an elevation as high as the most lofty of the Pentland Hills. But, beside this, and what is nearly equally bad, the temperature is rendered unnaturally high during winter; whereas, it has been proved that one great source of health and vigor in vegetation is the great difference which exists between the temperature of summer and winter, which difference amounts, in dry soil, to between thirty and forty degrees; while in soil, very much injured by an excess of water, the whole range of the thermometer throughout the year will probably not exceed from six to ten degrees.

"These are the chief injuries of an excess of water in soil which affect the soil itself. There are very many others affecting the climate, etc.; but these are not so connected with the subject in hand as to call for an explanation here.

"Of course all these injurious effects are at once overcome by thorough draining, the result of which is to establish a direct communication between the interstitial canals and the drains, by which means it follows that no water can remain any length of time in these canals, without, by its gravitation, finding its way to the drains.

"Too much can not be said in favor of pulverizing the soil; even thorough draining itself will not supersede the necessity of performing this most necessary operation. The whole valuable effects of plowing, harrowing, grubbing, etc., may be reduced to this; and almost the whole superiority of *garden* over *field* produce, is referable to the greater perfection to which this pulverizing of the soil can be carried.

"The celebrated Jethro Tull has the honor of having first directed the farmer's attention forcibly to the subject; and so deeply impressed was he with its infinite importance, that he believed the use of manure could be entirely superseded were this pulverizing carried to a sufficient extent.

"The whole success of the drill husbandry is owing, in a great measure, to its enabling you to stir up the soil well during the great progress of your crop; which stirring up is of no value beyond its effect in more minutely pulverizing the soil, increasing, as far as possible, the size and number of the interstitial canals.

"Lest any one should suppose that the contents of these interstitial canals must be so minute that their whole amount can be of little consequence, I may here notice the fact, that in moderately well pulverized soil they amount to no less than one fourth of the whole bulk of the soil itself; for example, 100 cubic inches of *moist* soil (that is, of soil in which the pores are filled with water, while the canals are filled with air), contain no less than 25 cubic inches of air. According to this calculation, in a field pulverized to the depth of eight inches, a depth perfectly attainable on most soils by careful tillage, every imperial acre will retain beneath its surface no less than 12,545,280 inches of air. A familiar illustration of the space occupied by the spaces between the particles of loosened soil is afforded by the fact that when soil is disturbed it more than fills the space it previoulsy occupied.

"Taking into calculation the weight of soil, we find that with every additional inch which you reduce to powder (by plowing, for example, nine inches in place of eight), you call into activity 235 tuns of soil, and render it capable of retaining beneath the surface 1,568,160 additional cubic inches of air. And to take one more element into the calculation, supposing the soil were not properly drained, the sufficient pulverizing would increase the escape of water from the surface by upward of 100 gallons per day."

So far as the legal distinction between *water of pressure* and springs is concerned, Judge French says:

"As we find it in our field, it is neither rain water, which has there fallen, nor spring water, in any sense. It has been appropriately termed the *water of pressure*, to distinguish it from both rain and spring water; and the recognition of this term will certainly be found convenient to all who are engaged in the discussion of drainage.

"The distinction is important in a legal point of view, as relating to the right of the land owner to divert the sources of supply to mill streams, or to adjacent lower lands. It often happens that an owner of land on a slope may desire to drain his field, while the adjacent owner below, may not only refuse to join in the drainage, but may believe that he derives an advantage from the surface washing or the percolation from his higher neighbor. He may believe that, by deep drainage above, his land will be dried up and rendered worthless; or, he may desire to collect the water which thus percolates, into his land, and use it for irrigation, or for a water ram, or for the supply of his barn-yard. May the upper owner legally proceed with the drainage of his own land, if he thus interfere with the interests of the man below?

"Again: wherever drains have been opened, we already hear complaints of their effects upon wells. In our good town of Exeter, there seems to be a general impression on one street, that the drainage of a swamp, formerly owned by the author, has drawn down the wells on that street, situated many rods distant from the drains. Those wells are upon a sandy plain, with underlying clay, and the drains are cut down upon the clay, and into it, and may possibly draw off the water a foot or two lower through the whole village—if we can regard the water line running through it as the surface of a pond, and the swamp as a dam across its outlet.

"The rights of land owners, as to running water over their premises, have been fruitful of litigation, but are now well defined. In general, in the language of Judge Story—

"'Every proprietor upon each bank of a river is entitled to the land covered with water in front of his bank to the middle thread of the stream, etc. In virtue of this ownership, he has a right to the use of the water flowing over it in its natural current, without diminution or obstruction. The consequence of this principle is, that no proprietor has a right to use the water to the prejudice of another. It is wholly immaterial whether the party be a proprietor above or below, in the course of the river, the right being common to all the proprietors on the river. No one has a right to diminish the quantity which will, according to the natural current, flow to the proprietor below, or to throw it back upon a proprietor above.'

"Chief Justice Richardson, of New Hampshire, thus briefly states the same position:

"'In general, every man has a right to the use of the water flowing in a stream through his land, and if any one divert the water from its natural channel, or throw it back, so as to deprive him of the use of it, the law will give him redress. But one man may acquire, by grant, a *right* to throw the water back upon the land of another, and long usage may be evidence of such a grant. It is, however, well settled that a man acquires no such right by merely being the first to make use of the water.'

"We are not aware that it has ever been held by any court of law, or even asserted, that a land owner may not intercept the percolating water in his soil for any purpose and at his pleasure; nor have we in mind any case in which the draining out of water from a well, by drainage for agricultural purposes, has subjected the owner of the land to compensation.

"It is believed that a land owner has the right to follow the rules of good husbandry in the drainage of his land, so far as the water of pressure is concerned, without responsibility for remote consequences to adjacent owners, to the owners of distant wells or springs, that may be affected, or to mill owners.

"In considering the effect of drainage on streams and rivers, it appears that the results of such operations, so far as they can be appreciated, are to lessen the value of water powers, by increasing the flow of water in times of freshets, and lessening it in times of drought. It is supposed in this country, that clearing the land of timber has sensibly affected the value of 'mill privileges,' by increasing evaporation, and diminishing the streams. No mill owner has been hardy enough to contend that a land owner may not legally cut down his own timber, whatever the effect on the streams. So, we trust, no court will ever be found, which will restrict the land owner in the highest culture of his soil, because his drainage may affect the capacity of a mill stream to turn the water wheels."

CHAPTER V.

DRAINAGE LENGTHENS THE SEASONS.

We have already shown that drainage removes stagnant surface water, and surplus ground water. The removal of these waters, as a necessary consequence, prepares the soil at an earlier period, for the labors of the farmer, than if left to natural causes alone.

The time required for the "settling of the soil," after the winter frost passes from it, depends, to a great extent, upon its porous or its retentive character, is everywhere known and conceded. The deep gravelly loam is seen to be very soon free from water, while the heavy clay requires a long time to become fit for cultivation. In the one case the soil is fully drained—in the other the water mostly passes off by the slow process of evaporation. The water being removed, prepares the ground to receive, to its fullest extent, the benefical influence of the sun's warming rays, to impart to the soil the proper temperature for the germination and growth of seeds and plants. Thoroughly drained soil is not unfrequently ready for the plow from ten to fifteen days earlier, than a similar undrained one. Ten days of advanced growth of corn, barley, oats, wheat or potatoes, have often protected these crops from the effects of drought, early frost, or insects. Ten to fifteen days of advanced maturity, would fully protect the earlier varieties of wheat grown in Ohio, from the ravages of the midge *(cecidomyia tritici)*, or the blighting effects of rust. The same advanced growth may secure the entire corn crop against early frosts, because in less time than that assumed, corn passes from the milky stage, when it would not require a severe frost to ruin it, to the glazed stage, when it is perfectly secure from the action of ordinary fall frosts. Potatoes, in the mean time, would be so far advanced as to be enabled, much better, to withstand the drought—such as we had in Ohio in 1854 and 1859—when the *very* early potatoes did well enough, but the late ones were almost an entire failure. Fifteen days of advanced maturity of the oat crop in Ohio, in 1858, would have saved the entire crop from the blight or rust; and thorough drainage will place these fifteen days at the farmer's disposal.

In what manner will drainage prepare the soil fifteen days sooner than an undrained soil? In the first place, the autumn rains will not so thoroughly stagnate in the soil, as they necessarily must, in an undrained one, because they will drain off all the superfluous moisture between the drain and the frozen surface during the fall and winter; then, in the spring time, drain off all the moisture from the surface, as it finds its way into the soil.

In order to demonstrate why drained soil is in order to be cultivated in the spring time, so much sooner than undrained, we introduce the following table copied from the Saxony experiments at *Tharand:*

1853. Feb.	Temperature of air.	Temperature of water.	1853. Mar.	Temperature of air.	Temperature of drain.	1853. July.	Temperature of air.	Temperature of drain.	1853. Aug.	Temperature of air.	Temperature of drain.
1	36.5	36.5	1	24.	33.8	1	67.	54.5	1	56.5	56.7
2	31.	37.	2	23.	33.	2	54.5	54.5	2	56.5	56.7
3	29.	37.5	3	26.6	33.	3	55.4	54.5	3	71.	56.7
4	31.	37.4	4	20.7	33.	4	53.6	54.5	4	64.4	56.5
5	31.	38.	5	24.	33.	5	60.	54.5	5	64.4	56.7
6	31.	38.	6	33.	33.5	6	63.5	54.5	6	55.4	56.5
7	30.	38.	7	35.	33.8	7	74.5	54.5	7	55.4	56.
8	32.	38.	8	38.	35.	8	78.8	54.5	8	54.5	56.
9	32.	38.	9	31.	35.	9	80.	55.	9	48.2	55.4
10	25.	38.	10	32.	35.	10	78.8	55.	10	55.4	56.
11	27.5	38.	11	27.	36.	11	62.	55.	11	53.6	56.
12	28.5	37.4	12	29.	36.	12	62.	55.	12	55.4	56.
13	22.	37.5	13	33.	36.5	13	73.4	54.	13	54.5	56.
14	23.	37.	14	33.	36.	14	71.6	53.6	14	56.	56.
15	21.	36.5	15	36.5	36.5	15	64.4	54.5	15	57.	55.4
16	21.	35.6	16	24.	56.	16	62.6	54.	16	56.5	55.
17	21.	34.2	17	17.6	36.	17	69.	54.	17	57.2	55.
18	15.8	34.2	18	17.6	36.	18	64.4	54.	18	56.5	55.
19	19.5	35.	19	19.4	36.	19	65.5	54.5	19	57.2	55.
20	21.	35.	20	17.6	36.	20	55.4	54.	20	66.2	54.5
21	23.	31.	21	21.2	35.	21	56.	54.	21	71.	54.5
22	24.8	33.8	22	24.	36.	22	69.	54.5	22	78.8	54.5
23	26.6	33.8	23	23.	36.	23	60.8	53.6	23	82.4	54.
24	26.6	33.8	24	22.	36.	24	62.	54.	24	78.	54.5
25	24.	33.8	25	23.	36.	25	77.	54.5	25	68.	54.5
26	16.5	33.8	26	21.2	36.	26	69.8	54.5	26	67.	54.5
27	28.5	33.8	27	17.6	36.	27	69.8	55.5	27	57.2	55.
28	27.5	34.	28	17.6	36.	28	77.	56.	28	60.	55.
			29	20.	36.	29	73.4	56.5	29	62.	55.
			30	26.6	36.	30	68.	56.7	30	52.	56.5
			31	27.5	36.	31	64.4	57.	31	67.	56.5

This table shows that during the months of February and March the water issuing from the drains had a much higher temperature than the atmosphere, and that during the months of July and August the drain water was much cooler than the atmosphere. On the 18th of February the temperature of the air was 15·8° Fahr., or 16·2° *below* freezing point, while the drain water stood at 34·2°, or 18·0° above the air.

The following table gives the mean monthly temperature of the atmosphere at 8 A. M. and 4 P. M., also of the drainage water at the same periods at Tharand, Saxony:

	Mean temperature of the air at 8 A. M.	Mean temperature of the drainage water at 8 A. M.	Mean temperature of the air at 4 P. M.	Mean temperature of drainage water at 4 P. M.
1853.				
February	26.	35.6	27.	35 6
March	25.	35.	31.	35.
April	38.7	38.	42.	38.
May	51.	44.6	61.	44.6
June	62.	50.	66	50.
July	67.	53.6	72.5	53.6
August	61.	54.5	67.	54.
September	56.7	53.6	60.5	53.6
October	49.	49.	55.	49.
November	37.4	46.4	38.5	47.
December	24.	37.4	24.	37.4
1854.				
January	29.	34.2	31.	34.5
Mean for the year	43.	44.	46.5	44.4

From this we learn that the temperature of the air for the months December, January, February and March, was below *freezing* point (32°), while the temperature of the drain water, during this entire period, was from 2·2° to 3·6°, above the freezing point; consequently, the drains were discharging water during the entire winter, and when spring came, the soil was not saturated with autumn and winter rains, as undrained soils necessarily are.

There is no doubt that temperature has considerable influence on the discharge of water from the drains. The observations recorded in the following table were made at Tharand, in Saxony, to determine the influence of temperature upon the dischaige of water from drains.

The following statements and observations are given as *theory* only—that is, theory in its true sense—inferences based upon facts or actual observations, in contradistinction to the usual definition of theory, viz: speculations, or hypothesis to explain facts or phenomenon.

Tabular Statement showing the influence of temperature upon the discharge of water from the drains; also, the influence of rains upon the discharge from drains.

	Temp. of atmosphere.		Quantity of Rain per day, per acre, in gallons.	Discharge of Drainage Water, daily, per acre.	Increase compared with the preceding day.
	Minimum.	Maximum.			
1853.					
March 7	32.	35.	——	280	38
" 8	35.	42.8	1624	2061	1781
" 9	33.5	42.	1919	3515	1454
" 10	32.	41.	295	4137	622
" 11	26.6	42.	——	5614	1477
April 1	24.8	46.4	——	2158	1264
" 2	37.5	45.5	1255	8605	6447
" 3	33.8	47.5	295	9410	805
1854.					
Feb'y 6	31.	44.	14541	5653	5018
" 7	44.6	47.	14614	11462	5809
March 2	28.4	40.	——	5245	4831
" 3	28.4	41.	——	7619	2374
" 9	39.2	44.6	5905	12154	4535
Dec'r 15	32.	49.	32772	7084	5837
" 16	35.	50.	54178	21463	14379

We will now, in addition to this theory, present some facts, or rather the testimony of various practical farmers on this question, and none more to the point than the following: At an agricultural meeting in Boston, Mr. B. F. Nourse, of Orington, Me., who was present, said that drainage on his farm "had put his springy, cold lands in good working condition, earlier in the season, than any other in the neighborhood. One lot drained in 1852, was in good working condition as soon as the frost was out. Before drainage, cattle could not cross it early in June without miring. It enabled the *later* as well as the *earlier* cultivation of the land. He had plowed as late as the 20th of November."

Mr. French, in his essay on drainage, refers also to Mr. Nourse's experience, making mention of a piece of corn he planted in this land on a drizzling rain, after a storm of two days. The corn came up and grew well; although on a clayey loam, formerly as wet as the adjoining grass field, over which oxen and carts could not pass on the day of this planting, without cutting through the turf and miring deeply.

Messrs. Maxwell Brothers, of Geneva, N. Y., in a statement of draining done on their farm in 1855, and which received the first premium of the State Agricultural Society, say they underdrained one clayey lot, which previously "it was quite impracticable to plow or cultivate in a wet time, and consequently it was very difficult to get in a spring crop in season." After underdraining "they could cultivate immediately after rains with advantage," and, of course, get in their crops much more seasonably than before. Mr. Yeomans, another central New York farmer and nurseryman, states that on his drained lands "the ground becomes almost as dry, in two or three days after the frost comes out in spring, or after a heavy rain, as it would do in as many weeks before draining," and the frost leaves drained land at least a week sooner than that which remains undrained.

It is a weighty argument for draining, that it relieves the ground of surplus water early in the spring, and so enables the work of the farmer and gardener to commence earlier than it otherwise could. It also makes that work easier and pleasanter. When the ground is undrained, it cannot become dry, except by evaporation, or by the oozing away of the water, particle by particle, through a long reach of stiff soil, into some natural outlet. Meanwhile, the farmer must sit with folded hands in comparative idleness, knowing that by the time his land had become dry, his work will accumulate and press upon him with a burden he can hardly bear. It would not be strange if some of that work should be left undone, or be slighted. Let but suitable drains be cut through that land, and the melting snows and drenching rains would speedily find their way in these channels, and leave the ground dry and warm, and ready for tillage several weeks earlier than fields not so treated. It would tend to relieve farm life of a great objection to it, in many minds, viz: that it imposes such hurrying and exhausting labors at particular seasons, and especially in spring. It would enable the farmer to get certain crops into the ground earlier, and so make sure of a vigorous growth before the drouth of midsummer, and of maturity before the frosts of autumn. The farmer at the extreme north, who sometimes repines at the shortness of the growing season, and the coldness of his soil, would thus practically gain almost a degree of south latitude, without the necessity of selling his farm and removing his household goods.

CHAPTER VI.

DRAINAGE DEEPENS THE SOIL.

It is a most important fact that drainage "deepens the soil," but in what manner this desideratum is accomplished none of the writers on the subject (whose works we have had the privilege of perusing) appear to explain. One writer* says:

"The effects of thorough draining in deepening the soil, are readily seen in a comparison of the characteristics of those wet and retentive, with those either naturally or artificially of a porous nature.

"All heavy soils must be shallow from the influence of stagnant water —of water which saturates the surface, not being able to pass away by filtration. Every fall of water gives a mortar-like consistency to such a soil, and as the moisture passes off by the slow process of evaporation, it becomes baked and brick-like, instead of light and friable. If plowed when wet, it is entirely unfit for the growth of crops; if stirred when dry, it turns up in clods and lumps; in either case, it is only after much labor that any finely pulverized earth is obtained to support and nourish vegetable growth, and an inferior crop is ever the result. *Saturation, without filtration, kills the productive power of any soil*—makes it hard, shallow and sterile, however rich in every element of fertility it may be, when differently situated in the single circumstance of drainage.

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* Editor, *Country Gentleman*.

"Porous, or well drained soils, on the contrary, never retain, even if they become saturated with water. The surplus moisture filtrates at once into the drains, leaving the surface loose and friable. Such a soil can be plowed at any seasonable time, and turns up mellow earth, readily fitted as a seed bed for any crop. Such a soil invites the roots of plants down, offering them food instead of a stone-like earth, and every year deepens the area of vegetable growth, until the full depth is reached to which it has been drained."

But then, after all, we have no explanation of how the soil is deepened, other than it becomes so by thorough drainage. The editor then produces the following capital statement of the fact, if any were needed, to prove that drainage deepens the soil:

"That draining deepens the soil, we will bring a single instance to show—one which confirms every point stated above. It is condensed from a letter from that pioneer drainer and pioneer of good farmers, John Johnston, near Geneva, N. Y., and was published in the *Country Gentleman*, of January 19, 1854. He says:

"'Last spring I concluded to plow a clayey field, containing forty acres, only once for wheat, and that after harvest. Previous to draining, it was one of my wettest fields, and in dry weather, even in April and May, was very hard to plow, often having to get the coulters and shares sharpened every day, when we used wrought-iron shares. Owing to the great drought before, during and after harvest, I got a large plow made, so that I could put two or more yokes of cattle, and a pair of horses to it if necessary. Immediately after harvest we started for the field, oxen and drivers, plowmen and horses; and beside new shares on the plows, took other new shares along, expecting to be obliged to change every day.

"'When we got to the field, I had one man put a pair of horses before the large plow, and try to open the land with a shallow furrow. He went seventy rods away and back without even a stop, except when the clover choked the plow. I then put the plow down to eight inches, and after one round, to nearly ten, and we went around without any trouble. His furrow was over nine inches deep, and laid as perfect as could be. I then had one yoke of oxen put behind my smallest horses, and a pair of horses before each of my other plows, and they plowed the field with perfect ease, only changing shares twice.

"'Although the field was undoubtedly plowed at the rate of nine inches deep, yet the clover roots went deeper, and the land plowed up as mellow as any loam; whereas, had it not been drained, it would have broke up in lumps as large as the heads of horses or oxen. A few years ago, a neighbor broke up a field about the same season, and similar land, but not drained, and after cultivating, rolling and harrowing, he had to employ men and mallets to break the lumps before he could get mold to cover the seed; and after all he did not get the third of a crop of either wheat or straw. My wheat looks as well as any I ever saw, and I doubt not it will be a good crop.'

"Those farmers, and they are not few, who have had experience in the cultivation of clayey soils when dry, or in any state, will not wonder that Mr. Johnston exclaimed, on finding this great change in the depth and friability of this clay bed: 'I never was more agreeably surprised in my life—in fact, had my men been plowing in gold dust as they do in California, I should have been no more pleased.' This great change was the simple effect of thorough drainage—the soil, no longer compelled to remain saturated with water, lost its brick and mortar character, and became a *live*, or at least an active and productive soil, ready to reward the labor of the farmer."

A correspondent, reviewing Judge French's work on drainage, says:

"In his chapter on the effects of drainage upon the condition of the soil, the author of '*Farm Drainage*,' announces the proposition that 'drainage deepens the soil.' How this effect is produced we are not told, though a hint is given that it 'lowers the line of standing water,' and then we are treated to a page or so of reasoning and authorities to show that plants send their roots to a great depth if the soil admits. We are told also that the roots of few plants, except those of an aquatic character, will grow or live in stagnant water. Hence we are left to conclude that 'drainage deepens the soil.'"

And thus it is with all authorities; they state the fact, and this is perhaps, all that the present locomotive, telegraph, lightning press, steamship age requires; but the inducement for those to underdrain who are deprived of the privilege of seeing and examining the practical workings of underdraining, will be much stronger if the *chain* of the argument is complete—not having a single defective link in it.

Alderman Isaac J. Mechi, speaking of draining heavy lands, says:* "I consider it an axiom that the friability of the soil will be in proportion to the rapidity of percolation. Filtration may be too sudden, as is well enough shown by our hot sands and gravels; but I apprehend no one will ever fear rendering strong clays too porous and manageable. The object of drainage is to impart to such soils the mellowness and dark color of self-drained, rich and friable soil. That perfect drainage and cultivation will ultimately do this is a well-known fact. I know it in the case of my own garden. How it does so I am not chemist enough to explain in detail; but it is evident the effect is produced by the fibers of the growing crops intersecting every particle of the soil, which they never could do before draining; these, with their excretions, decompose on the removal of the crop, and are acted on by the alternating air and water, which also decompose and change, in degree, the inorganic substances of the soil. Thereby drained land, which was before impervious to air and water, and consequently unavailable to air and roots, to worms, or to vegetable or animal life, becomes, by drainage, populated by both, and is a great chemical laboratory, as our own atmosphere, subject to all the changes produced by animated nature."

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* *How to Farm Profitably*, page 49.

The explanation given above is not much more satisfactory than the preceding ones, with this exception: he hints at a *chemical* mean, while the others are rather inclined to attribute it entirely to a *mechanical* one; but both leave us to infer that the roots of the crops have much to do with producing the mellow condition of the soil. A correspondent of the *Country Gentleman*, over the signature of "A READING FARMER," concludes that the roots of a crop are not essential to produce this condition, for he says:

"A simple experiment will convince any farmer that the best mean of permanently deepening and mellowing his soil, is by thorough drainage, to afford a ready exit for all surplus moisture. Let him take, in spring, while wet, a quantity of his hardest soil—such as it is almost impossible to plow in summer—such as presents a baked and brick-like character, under the influence of drought—and place it in a box or barrel open at the bottom, and frequently during the season let him saturate it with water. He will find it gradually becoming more and more porous and friable—holding water less and less perfectly as the experiment proceeds, and in the end it will attain a state best suited to the growth of plants from its deep and mellow character. Here we have the result of drainage as it acts upon the soil. It may require time to act—probably on heavy clays more than a single season, but it will act in conjunction with other natural influences to give depth and friability to the soil."

Now, so far as ourself is concerned, we agree with all the authorities we have quoted, that drainage "deepens the soil," by "lowering the line of standing water," "by roots of crops," by making the subsoil accessible to a "vegetable and animal life;" but, at the same time, we are of opinion that there is another agent, which we find no where mentioned in this connection, whose influence in mellowing and deepening the soil is just as powerful as the causes just cited.

Some years since, in conversation with a very intelligent gentleman, a farmer, but an Englishman by birth, we expressed our surprise that while he spoke so very highly of everything *English*, that he did not use a Crosskill's clod crusher, that being eminently English. "For the very reason," replied he, "that in this country (U. S.) we have an infinitely cheaper, and much better '*clod crusher*' than Crosskill's, or any the English can invent, unless the gulf stream should change its course." What relation possibly could exist between the gulf stream and a clod crusher we could certainly not divine, and as we looked inquiringly into our friend's face to assure ourself of his sanity, he laughingly replied: "I mean JACK FROST." True they have frosts in England, but no comparison to the frosts we have here—their frosts are rather mild and good natured, like John Bull himself, after he has just risen from the enjoyment of his favorite *roast beef*, while the frosts here act with the force of a locomotive running eighty miles an hour, breaking up, tearing up, and smashing things generally. Plow up a stiff clay in the fall, and let Jack Frost have fair play on it until next April, and Crosskill's clod crusher might be very thankful if the next harvest awarded it a *second* premium, while Jack Frost would take the first over all competitors.

Jack Frost, in our opinion, is the certain other agent above alluded to. In a drained clay, the late fall or early winter rains always leave moisture enough for the frost to congeal, and every congelation separates particles of the soil; then, when a thaw takes place, the water is borne off into the drain. In fact, in three feet drains the process of thawing is going on from below upward all the while; hence, in springtime, drained soil is dry, or ready to work in a few days. Jack Frost, in this manner, institutes beneath the soil, in the words of Alderman Mechi, "as great a chemical laboratory as our own atmosphere." Our own observation is, that mild winters are never succeeded by as bountiful harvests as more severe ones are; but then winters may be *too* severe, as well as too mild; yet drained soils, in either event, fare much better than undrained ones.

We do not think that heavy clay soil, drained in the spring and plowed in the fall of the same year, would plow so much easier, as Johnston, just above quoted, states that his did, or as that did in the following extract from a correspondent to the *Country Gentleman:*

"A Western New York farmer had a wet soil, thoroughly underdrained with tile—a field of forty acres. It had always been very hard and difficult to plow in the summer, taking a strong force of teams, and wearing out the plow very rapidly, and still the work was done in a very imperfect manner. After draining, he concluded to plow it once after harvest for wheat, as it had lain for some time in clover. He went on with it with his triple teams and large plows, but found that a single team could turn a furrow ten inches deep with perfect ease. The land plowed up as mellow as any loam, where, previous to draining, at that season it would have been broken up in lumps as large as the heads of his horses. To drainage he attributed the change, and we have no doubt that the deep mellow state of the soil resulted entirely from 'lowering the line of standing water;' from affording it opportunity for *filtering* rapidly through the soil, instead of rising slowly as *evaporated* by the heat of summer."

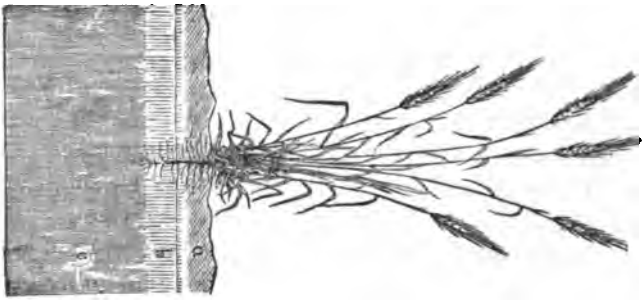
Deepening the soil is certainly a great desideratum with every intelligent agriculturist, since every inch of depth of soil gives 100 tuns of active soil per acre for the nutrition of the growing crop. Those who argue that the cultivated plants obtain all their nourishment in a soil 8 or 10 inches deep, certainly have never investigated the subject. The writer remembers distinctly that many years ago he measured the roots of the oat plant, found in the course of digging a cellar, which had penetrated the soil to a depth of four feet. At another time, under similar circumstances, the roots of the wheat plant were found to have penetrated to a depth of five feet and several inches. Roots of the corn plant were found at a depth of three feet. Mr. Denton, an English writer, quoted by Judge French, says:

"I have evidence now before me that the roots of the wheat plant, the mangold wurzel, the cabbage and the white turnip frequently descend into the soil to the depth of three feet. I have myself traced the roots of wheat nine feet deep. I have discovered the roots of perennial grasses in drains four feet deep; and I may refer to Mr. Mercer, of Newton, in Lancashire, who has traced the roots of rye grass running for many feet along a small pipe drain, after descending four feet through the soil. Mr. Hetley, of Orton, assures me that he discovered the roots of the mangolds, in a recently made drain, five feet deep; and the late Sir John Conroy had many newly-made drains, four feet deep, stopped by the roots of the same plants."

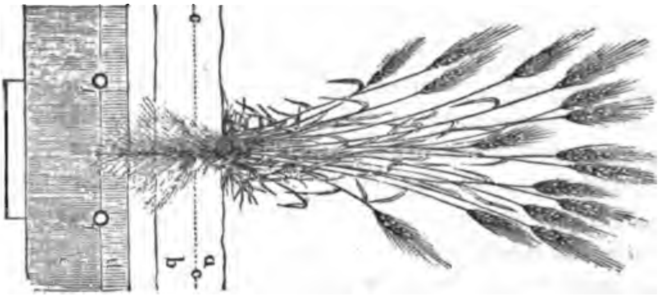
It certainly requires no argument to prove that the roots of plants can not penetrate to these depths in a "water-logged," compact clay soil.

The following cuts (Figs. 7 and 8) *prove* that drainage deepens the soil. In Fig. 7, *a* represents the surface soil; the line between *a* and *b* the line of capillary attraction; *c*, ground water, and the line between *b* and *c* is the ground water line. The plant is weak, has few heads and very few roots. In Fig. 8, *a* is the surface soil; *e*, the ground water; *f f*, drains, 3 feet deep; *d*, water of capillary attraction. It is a well-known fact, that the roots go down to the water table, whether it is at *b*, Fig. 7, at 10 inches depth, or at *f*, Fig. 8, at 3 feet depth. The plant in Fig. 8 is thrifty, has great and many roots and numerous heads. We have known a single grain of wheat, on such soils in Ohio, produce 60 perfect heads of wheat. In the spring time the roots and foliage of wheat on such soil are represented by Fig. 9.

[FIG. 7.]



[FIG. 8.]



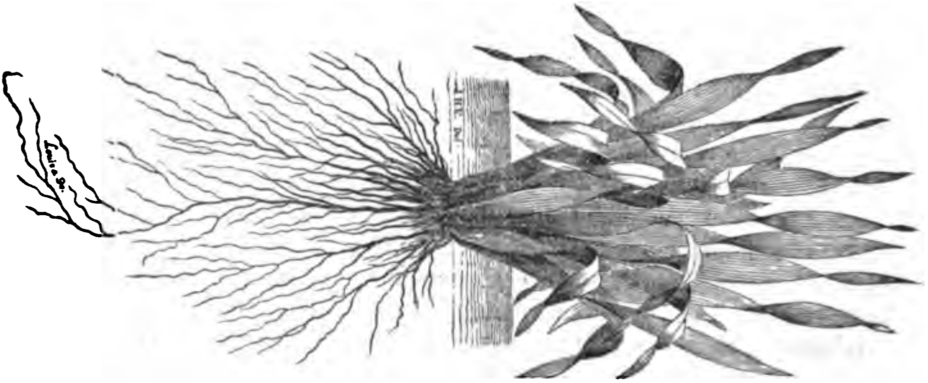


FIG. 9.—Appearance of foliage and roots of the wheat plant in the spring, on an underdrained soil.

CHAPTER VII

DRAINAGE WARMS THE UNDER SOIL.

Professor Johnston says:

"As the rain falls through the air it acquires the temperature of the atmosphere. If this be higher than that of the surface soil, the latter is warmed by it; and if the rains be copious, and sink easily into the subsoil, they will carry this warmth with them to the depth of the drains. Thus the under soil, in well-drained land, is not only warmer, because the evaporation is less, but because the rains in the summer season actually bring down warmth from the heavens to add to their natural heat."

There are two reasons why wet lands are always cold, and especially so in the spring: one is, the slow conduction of heat downward through a body of water; the other is, the heat lost in the evaporation of water. When heat is applied to the bottom of a vessel containing water, the portions that are first heated expand, become specifically lighter, ascend, and give place to heavier and colder portions. These, in turn, are heated and ascend, and thus a constant circuit is maintained until the whole is equally heated. When heat is applied to the top of a vessel of water, the upper stratum is heated; but this remains on the top, and no movement in the liquid brings unheated portions in contact with the fire, consequently heat passes downward through water slowly, and with great difficulty. Hence, a wet piece of land, which receives its heat from the sun's rays acting on the surface, will be a long time in being warmed to any depth.

The removal of surplus water by evaporation interferes still more with the warming of the soil in the spring. The vapor of water may be described as a compound of water and heat. Not more certain is it that water is taken from the soil by evaporation, than that a definite proportion of heat passes off with it. And hence, lands from which a large amount of water has to be removed in the spring by evaporation, are kept cold until the process is finished. The cooling effects of evaporation are highly beneficial under some circumstances, but on wet lands, in the spring of the year, they are anything but desirable.

It follows, therefore, that the way to make cold, wet lands warm, is to resort to thorough drainage; and this, experience has shown, has the effect to raise the temperature of the soil many degrees through the whole spring. Not only is the heat communicated by the sun's rays retained, instead of being carried off in converting water into vapor, but dry soil, or any other solid bodies, will transmit heat downward better than liquids; in addition to this, a dry soil has its interstices filled with an air which diffuses heat, and helps to elevate the temperature.

A warm soil in the spring has a great advantage over a cold one. The seeds, planted or sown germinate at once, and don't permit the hardier seeds of weeds to get the start of the crop. Or, if the farmer chooses to stir the soil two or three times before putting in the crop, the seeds of weeds have the opportunity to germinate early, so that the young weeds may be killed by subsequent workings before the intended crop is sown. It is the experience of all, that drained lands are much easiest kept clean. But the temperature of the soil has a controlling influence on the growth of corn and some other spring crops. Corn will germinate when the temperature of the soil is about 55° Fahrenheit; a few degrees lower it will rot in the ground. In fact, fault is often found with seed corn, when the only difficulty is in the want of sufficient warmth in the soil. Barley, oats, and spring wheat may be sown on drained lands almost as soon as the frost is out, and there is little or no risk of the seed perishing. If the temperature of the atmosphere is not sufficient to justify growth above ground, if the soil be only warm enough, the plant will make the better growth of roots below.

The following illustration of the manner in which drainage warms the under soil, we find in the Patent Office Report for 1856, over the signature "D. J. B." (D. J. Browne):

"The reason why drained land gains heat, and water-logged land is always cold, consists in the well-known fact that heat can not be transmitted *downward* through water. This may readily be seen by the following experiments:

"*Experiment No.* 1.—A square box was made eighteen inches deep, eleven inches wide at top, and six inches wide at bottom. It was filled with peat saturated with water, forming, twelve and a half inches in depth, a sort of artificial bog. The box was then filled with water to within five inches of the top. A thermometer was plunged, so that its bulb was within one inch and a half of the bottom. The temperature of the whole mass of peat and water was found to be 39½° Fahr. A gallon of boiling water was then added; it raised the surface of the water to a point two inches below the top. In five minutes the thermometer rose to 44°, owing to the conduction of heat by the thermometer and its guard tube; at ten minutes from the introduction of the hot water, the thermometer rose to 46°, and it subsequently rose no higher. Another thermometer, dipping under the surface of the hot water, was then introduced, and the following are the indications of the two thermometers at the respective intervals, reckoning from the time the hot water was supplied:

	First thermometer.	Second thermometer.
20 minutes	46 deg.	150 deg.
1 hour 30 "	45 "	101 "
2 hours 30 "	42 "	80½ "
12 hours 40 "	40 "	45 "

"The mean temperature of the external air to which the box was exposed during the above period, was 42°, the maximum being 47°, and the minimum 37°.

"*Experiment No.* 2.—With the same arrangement as in the preceding case, a gallon of boiling water was introduced above the peat and water, when the first thermometer was at 36°; in ten minutes it rose to 40°. The cock was then turned for the purpose of drainage, which was but slowly effected; and, at the end of twenty minutes, the thermometer indicated 40°; at twenty-five minutes, 42°, while the second thermometer was 142°. At thirty minutes the cock was withdrawn from the box, and more free egress of water being thus afforded, at thirty-five minutes the flow was no longer continuous, and the second thermometer indicated 48°. The mass was drained, and permeable to a fresh supply of water. Accordingly, another gallon of boiling water was poured over it; and, in

3	minutes	the first thermometer	rose to	77	deg.
5	"	"	fell to	76½	"
15	"	"	"	70½	"
20	"	"	remained at	71	"
1 hour 50	"	"	"	70½	"

"In these two experiments, the thermometer at the bottom of the box suddenly rose a few degrees immediately after the hot water was added; and it might be inferred that the heat was carried downward by the water. But, in reality, the rise was owing to the action of the hot water on the thermometer, and not to its action upon the cold water. To prove this, the perpendicular thermometers were removed; the box was filled with peat and water to within three inches of the top, a horizontal thermometer, having been previously secured through a hole made in the side of the box, by means of a tight-fitting cork, in which the naked stem of the thermometer was grooved. A gallon of boiling water was then added. The thermometer, a very delicate one, was *not in the least affected* by the boiling water in the top of the box.

"In this experiment the wooden box may be supposed to be a field; the peat and cold water represent the water-logged portion; rain falls on the surface, and becomes warmed by contact with the soil, and, thus heated, descends; but it is stopped by the cold water, and the heat will go no further. But, if the soil is drained, and not water-logged, the warm rain trickles through the crevices of the earth, carrying to the drain level the high temperature it had gained on the surface, parts with it to the soil as it passes down, and thus produces that bottom heat which is so essential to plants, although so few suspect its existence."

CHAPTER VIII.

DRAINAGE EQUALIZES THE TEMPERATURE OF THE SOIL DURING THE SEASON OF GROWTH.

We have already shown that the discharges of water from drains are always several degrees above freezing point; and as heat naturally tends *upward*, that the soil is measurably warmed from below during the germinating season of the seeds, so that not unfrequently the soil is, during the entire month of April, much warmer than the air at night, although, perhaps, colder than the air during the day. The soil of a drained field is, therefore, free from the extremes of temperature of day and night air, during the same time. Again we have shown, by the tables copied from observations at Tharand, in Saxony, that the drains have a lower temperature during July and August, than the air. Thus, while drains equalize the temperature of the soil, and exempt it from the extremes of day and night temperature, it also equalizes it, and exempts it from the extremes of winter and summer temperatures. Prof. Johnston says:

"The sun beats upon the surface of the soil and gradually warms it. Yet, even in summer, this direct heat descends only a few inches beneath the surface. But when the rain falls upon the warm surface, and finds an easy descent as it does in open soils, it becomes itself warmer, and carries its heat down to the under soil. Then the roots of plants are warmed, and general growth is stimulated."

CHAPTER IX.

DRAINAGE CARRIES DOWN SOLUBLE SUBSTANCES TO THE ROOTS OF PLANTS.

Prof. Johnston says: "When rain falls upon heavy undrained land, or upon any land into which it does not readily sink, it runs over the surface, dissolves any soluble matter it may meet with, and carries it to the nearest ditch or brook. Rain thus robs and impoverishes such land."

It must be self-evident to every observing person, that the advantage of rain to growing crops is to furnish them with new supplies of nutrition. In undrained lands the "water line" being near the surface, most of the benefits to growing crops which might be derived from rains are lost, either by evaporation of volatile substances, or, being in a soluble condition, they are washed to lower levels of surface, or into streams. The ground being already saturated from below, prevents the entrance from the surface of the desired elements; but in a drained soil on account of its greater porosity or mellowness and lower level of the water line, these substances can readily penetrate from the surface. The subject of the "absorbing qualities of arable soil" having been extensively discussed, within the last few years, by the best agricultural chemists of England and the continent, it may not be inappropriate to present a summary of the experiments and the conclusions deduced from them.

In 1848, Messrs. Huxtable and Thompson discovered, in arable lands, the property of fixing some of the elements of manures. Mr. Huxtable, having filtered some barn-yard liquid through some earth, obtained it deprived of color and bad odor. At the same time H. S. Thompson found the earth to possess the faculty of retaining, in an indissoluble state, the alkali of an ammoniacal solution, and even of solutions in which the bases were no longer in a free state, but were in combination with hydrochloric acid, and sulphate and nitrate of ammonia.

Mr. J. T. Way having been made acquainted with these remarkable results, undertook a long series of researches with the view of determining the cause and conditions of this absorption; he found that the absorbing property of the earth is not confined to ammonia only, but that it is extended to all alkaline and earthy bases, which are necessary for the growth of vegetation; such as soda, potash, magnesia, and lime, either free or involved in combinations.

After numerous experiments, which were repeated with the view of ascertaining whether the property of retaining the elements of manures really existed in the arable soil, Mr. Way endeavored to express by numbers the value of this absorption. For that purpose he caused a quantity of earth to be digested in a solution of the compound he wished to operate upon, the difference in degrees which the composition of the liquid indicated after its contact with the earth, showed what had been absorbed.

By this operation Mr. Way found that 1000 grains of either clay or earth could absorb from a solution which contained 3173 per cent. of ammonia (or $3\frac{173}{1000}$ grains of ammonia in 1000 grains of solution) quantities of alkali ranging from $1\frac{570}{1000}$ grains to $3\frac{921}{1000}$ grains, differing only with the difference in the soils or clays, the per cent. being uniform in repeated experiments with the same earth.

There is nothing absolute in these figures; they are modified by the degree of concentration of the liquid and the quantities of either earth or liquid which are used.

The absorption takes place with great rapidity, and is as complete in half an hour as it is after remaining in contact during fifteen hours; when the experiment is made with a salt of ammonia it is decomposed, the bases only are fixed, while the acid is totally eliminated in a state of calcareous salt, in the decanted liquid.

What is the cause of this phenomenon? Is it caused by the presence of the lime, or of the organic matter? Is it owing to the free aluminium which may be in the soil? Mr. Way does not think so, because no greater absorption of ammonia is obtained by adding carbonate of lime to clay, free from this basis in a carbonated state, but containing a small proportion of the calcareous element; on the other hand, the incineration of the clay could not entirely destroy the decomposing and absorbing power of this earth, either on salts or bases; finally, the treatment by hydrochloric acid causes the solution of the aluminium to diminish, but does not destroy the decomposing and absorbing power of clay.

The rapidity with which the absorption of the bases by earth is effected, led Mr. Way to suppose that a chemical combination was formed; in such a case the absorption of an alkali other than ammonia ought to take place, in the proportion of the two elements.

When acting with a salt of potash, 1000 grains of earth retained $4\frac{366}{1000}$ grains of potash; the absorption was then more considerable, without being, as it ought to have been, in the prevision of the hypothesis; and nevertheless, the liquid contained potash (substituted for ammonia,) in true proportion indicated by the equivalents, that is, $8\frac{255}{1000}$ of potash to 1000 grains of solution. In this case, as with ammonia, the more concentrated liquids produce a greater absorption; and when the salt was replaced by a solution of caustic potash, 1000 grains of earth retained $11\frac{716}{1000}$ grains of alkali; this absorption was still increased when the earth had previously been boiled in an acid.

As it was easy to foresee, the salts of lime in solution underwent no modification when filtered through the earth; but lime water, according to the quantities which are employed, imparts, in similar circumstances, a quantity of alkali, which, in 1000 grains of earth, varies from $2\frac{31}{100}$ grains, to $14\frac{68}{100}$ grains.

When the lime is in the form of a carbonate, dissolved in water containing carbonic acid, the absorbtion is $7\frac{31}{100}$ grains of carbonate of lime for 1000 grains of earth.

The salts of soda and magnesia undergo a transformation in the soil, similar to that of the other alkaline compounds; but the action is less conspicuous, and gives no occasion for numerical determinations.

The bases being retained by the soil, the acids which, like phosphoric acid, form with lime insoluble compounds, ought to be insoluble also; this idea was confirmed by two operations of Mr. Way: in the one, water in which flax had been steeped; and in the other, sink water was employed; both were filtered through earth; the soil retained precisely all the substances which are the most useful to vegetation, such as organic matters in general, or nitrogenous substances only, the phosphoric acid, potash and magnesia; while the others were absorbed only in part, or were found in greater proportion in the filtered water.

Mr. Way was led, by these experiments, to the following conclusions:

1. The plants do not absorb the manure in a state of solution. Next, the form under which mineral matters and ammoniacal salts are applied, is different; because the soil possesses the power of bringing them back to a special state, in which these substances are presented to the plants, an important circumstance for the agriculturist who endeavors to introduce an alkali as manure into the soil; the salt that will supply that alkali at the lowest price, will, of course, obtain the preference.

It was also found by Mr. Way, that clay possesses antiseptic qualities, because urine filtered through clay did not undergo putrid fermentation. From this fact, we have reason to infer that plants do assimilate nitrogenous substances other than ammonia and nitric acid.

Finally, Mr. Way thinks that manures, and by all means artificial ones, ought to be spread with great evenness, in order to secure everywhere uniform vegetation; because capillarity would be unable to disseminate the fertilizing substances, by means of diffusion, on account of their insolubility. The same cause would permit the application of large quantities of manure, without fear of any loss through drain water, because a good soil may retain, without waste, sixty times as much of the fertilizing elements as are applied with the manures.

Messrs. W. Henneberg and F. Stokmann, after repeating Way's experiments, confirmed in every point his conclusions; they found the results so perfectly regular, that Mr. Bœdecker was enabled, from their data, to establish algebraic formulæ, showing the value of absorption on any given quantity of earth, of liquid, and degree of solution.

Liebig resumed Way's experiments, and confining himself to the study of arable lands, ascertained that all soils possessed very nearly the same absorbing power; he found, as did Mr. Way, that soils, either rich or poor in carbonate of lime, did not manifest that power with the same intensity with all bases; thus, in filtering barn-yard liquid, potash was retained with more readiness than soda. $\frac{125}{1000}$ grammes of barn-yard liquid which contained, before being filtered—

Potash	grains.	0.0867
Soda	"	0.0168

contained, after being filtered—

Potash	grains.	0.0056
Soda	"	0.0118

whereas, the whole of the ammonia was retained.

The alkaline silicate of potash is acted upon by the earth like other salts of potash; the basis is absorbed, and in the same time a quantity of the silica is retained. While the absorption of the basis by various soils offers but small differences, the absorption of the silica appears to be in an inverted ratio, as the organic substances present in the soil, which are mostly of an acid reaction; and, strongly saturating the earthy bases, such as lime and magnesia, they present an obstacle to the fixation of silica.

The solution of silicate of potash, which was acted upon, contained per quart:

Potash	grains.	1.166
Silica	"	2.780

The absorption for 1,000 cubic centimetres of various soils, was as follows:

	Potash.	Silica.
Earth from a forest	gr. 0.951	gr. 0.115
" from a garden	" 1.055	" 1.081
" from Bogenhausen	" 1.148	" 2.007
" from Hungary	" 1.151	" 2.644

The soil from the forest was full of organic detritus, being mixed with milk of lime up to the alkaline reaction, and then dried, absorbed:

Potash	grains.	0.987
Silica	"	3.169

Liebig thinks that this absorption is owing partly to the chemical action of silicates and hydrate of aluminum upon the silicate of potassium, and besides that it must be connected with the physical state of the soil.

Phosphate of lime, dissolved by means of carbonic acid, is entirely retained by the soil; the same happens with ammoniaco-magnesian phosphate; the only soil of Tchernosem made an exception with phosphates; but Liebig found that it was saturated with them.

In view of the above facts, and considering the small proportion of mineral substances which are dissolved by drain water, from the analysis of Messrs. Way and Krocker, Liebig comes to the same conclusions as Mr. Way, that manures are presented to plants under a special form, and that on account of the insolubility of the new compounds which are formed, there must be in the roots a peculiar force, allowing them to select and assimilate substances which they are unable to obtain from a solution.

Liebig thinks, however, that aquatic plants, such as *lemna trisulea*, the roots of which swim in water without direct communication with the soil, are submitted to other laws, and absorb their nutriment in a state of solution. It was proved by analysis, that it was so, because the water in which these plants grow, contains in solution all the mineral matter which is found in the ashes.

The alimentation of plants would not then be as simple as physiologists and agriculturists did suppose; nor would it be the same in process for all species. The importance of the result in the agricultural point of view, and also the deep interest involved in the study of the absorbing power of soils, are a sufficient stimulus for renewing and enlarging investigations.

Mr. Boussingault intrusted F. Brustlein, of the Conservatory of Arts of Paris, with the work of continuing the investigation. He reports that "it was performed in his laboratory, at the Conservatoire des Arts et Metiers." We present a translation of this report:

"The rapid and perfect exactness with which ammonia is measured with Boussingault's apparatus, the importance of this alkali as an agent of fertilization, and the identity of its reactions with those of the other bases in the soil, suggested the exclusive use of ammonia for the experiments.

"Three specimens of soil were tested, and each of them possessed a physical character widely different. The first, taken from Bechelbronn, is a tenacious, compact clay, rich in carbonate of lime, retaining water, and when dried, very hard. The second, from Mittelhausbergen, is the *lehm* (loam) of the fertile neighborhood of Strasbourg, very rich in carbonate of lime, with little plasticity, but very homogeneous. The third is the soil of Liebfrauenberg's orchard, sandy, quartzose, very rich in organic detritus, remains of ancient and very powerful manuring."

* * * * * * *

From the above experiments we may derive the following conclusions: The property of absorbing ammonia by arable lands is exclusively dependent on the physical constitution of the mineral substances, and even on the organic matters with which they are formed. This was made evident by the action of humus, peat and animal black upon an ammoniacal solution; the former two decompose at the same time a noticeable proportion of alkali. The existence of a carbonate in the soil is necessary, so that the earth may decompose an ammoniacal salt in retaining the basis of it; animal black is possessed of that faculty when carbonate of lime has been incorporated. The decomposition being stopped strictly at the quantity of salt, the ammonia of which has been fixed, the force which impels the absorption is powerful enough to provoke this double decomposition.

We know with what readiness ammoniacal salts are decomposed in presence of carbonate of lime. Mr. Boussingault demonstrated that moist carbonate of lime, in presence of a fixed salt of ammonia, sets free, in time, and dries up all the ammonia in a state of volatile carbonate; the same happens when a very weak solution of hydrochloric acid boils in presence of carbonate of calcium.

The absorption of ammonia by the soil, in an atmosphere which is loaded with it, is considerable, as stated by Mr. Way. When the air, very limited in ammonia, is passed through a long column of earth, the latter absorbs almost the whole quantity of the ammonia, and loses it again, in great part, by the action of currents of moist air. These experiments do not permit us to draw conclusions as to the absorption of ammonia by the earth from the atmosphere; because, in the experiment, when that alkali was most minutely diffused through the air, it was found that the air which traversed the apparatus contained 225 times as much ammonia as the air which circulates at the surface of the globe.

With the earth loaded with ammonia, and exposed to the air when moistened, there was a production of azotic acid; but this production was not large enough, if we compare it with that which took place in the experiments on nitrification of arable land, made at Liebfrauenberg, in 1857, by Mr. Boussingault, so that we cannot affirm that it was owing to the transformation of the volatile alkali.

The ammonia absorbed by the earth is of great stability as long as the earth is dry; but as soon as water intervenes it causes, by evaporation, the dissipation of the ammonia. This phenomenon is well known to agriculturists who park their sheep; because urine, impregnating the earth's surface, putrefies within 24 hours, with a temperature of 15° centigrade; it then emits ammoniacal vapors, which are wastefully rising, unless promptly checked by timely plowing. This volatilization of ammonia in arable land proper is a fact which was constantly observed by Mr. Boussingault in his researches on the atmosphere confined in the soil.

The earth, according to its richness in ammonia and its force of retention, imparts to water greater or lesser quantities of alkali, independent, in some measure, of the proportion of the liquid. Water, containing very minute quantity of ammonia, seems to be endowed with the property of circulating through the soil; because, in the above experiments, water was never entirely deprived of its alkali by the earth, even when contained in extremely limited proportions. Taking into account the feeble dose of ammonia which exists in the soil, its solubility, how small soever, and then its diffusion—knowing that the reactions of the other alkalies, except the volatility, are identical with those of ammonia—it seems very probable that plants select the largest part of their nutriment from very weak solutions, in which is found the azotic element, so necessary to them, in a state of ammonia or nitric acid. It cannot be doubted that such is the fact; aquatic vegetables stand as a proof of it; and Boussingault, by beautiful experiments, did establish that a plant acquires a complete growth in a soil formed with a sand of pure quartz previously calcined, provided it be supplied with nitrate of potash, phosphates and alkaline ashes. In this condition the vegetable is then compelled to derive its nutriment from a solution.

CHAPTER X.

DRAINAGE PREVENTS "HEAVING OUT," "FREEZING OUT," OR "WINTER-KILLING."

We have frequently heard farmers complain of portions of fields, and sometimes of entire fields, that winter crops would "winter-kill" or "freeze out" on them. In point of fact, we have known of several farms which, in other respects, were good farms, sold at a reduced price because certain portions were "*spouty.*" This "spoutiness" is easily remedied by underdraining. The cause and process of freezing out are explained as follows: In places where it occurs there is a stratum of clay, or hard pan, at the depth of a few inches, or a foot from the surface. This stratum is nearly impervious to water. The soil has been pulverized by plowing, and absorbs like a sponge the autumn rains, and the melting snows in the spring time; it not only absorbs, but retains these waters, because there is no way for them to escape except by evaporation, and this takes place to a very limited extent only in cold weather. The ground is frozen during the night and the water converted into ice; this process of freezing not only severs the smaller roots and sometimes the larger ones, but throws up the soil in *scales* or spicules, thus drawing the clover or wheat roots from their beds. When a thaw comes, the saturated soil settles down and exposes the roots, and a few repetitions of this process, which occurs every winter, leave the plants dead upon the field in the spring.

Underdraining affords a certain outlet or escape for the waters. Winter grain crops seldom suffer from freezing when the soil is dry. We know of several instances where "freezing out" was effectually remedied by underdraining; but, as we prefer the evidence of others to our own observation, we again quote from the *Country Gentleman:*

"A case coming under our observation the past winter will well illustrate the subject. A field of five acres, seeded to clover two years ago upon rye, owing in part to the presence of snow upon the ground the greater part of the first winter and spring, escaped with slight injury from this cause, and gave a very good growth of clover. But the past winter, the weather being of a different character, the grass on about three acres of the field was entirely destroyed, every root of clover, being pulled up or thrown out, laid loose upon the surface of the ground the present spring. This was an example of 'heaving out' of unmistakable character.

"The evil lies in *a saturated soil.* It matters little whether the surface be clay or sandy—it did not in the case above mentioned—if the subsoil is of an impervious character. We were much surprised to find in a slight depression, some three or four rods across, where the surface soil was a light sand, that the clover was as badly winter killed as on the clayey part of the field; and the clayey part, it is well to mention, had good surface drainage from the descent or slope of the ground—at least an inch in a foot. This sandy corner was underlaid by an impervious hard pan, holding water equally as well as the clay; and we believe this will generally be found to be the case in all loams which suffer from heaving or freezing out.

"We have shown, in a previous article, that 'draining deepens the soil,' and hence it is *the* remedy for freezing out in all cases. Water no longer saturates the surface soil in such quantity as to form honeycomb ice every time it freezes; the plants are no longer confined to short roots, but have a better hold upon the soil, and it has been found that no loss whatever results from this cause, however unfavorable the season, on a thoroughly drained soil.

"A little testimony on this point may not be out of place here. Maxwell Brothers, of Geneva, tell us, in the *Transactions of the N. Y. State Agricultural Society*, for 1855, about draining a clay field, which previously could not be worked for spring crops in season for sowing, and *heaved so badly as to ruin winter crops*, which draining has rendered as mellow and productive as can be desired, so that they can cultivate immediately after heavy rains, and grow wheat and clover without loss from frost. John Johnston, of Seneca county, has given pointed evidence on the subject. By draining he has so improved his clayey farm that no loss is suffered from this cause, though formerly it was a source of great injury to the crops in the low lands, entirely ruining wheat, and destroying it in many places upon the higher parts of the farm. Many like cases of the beneficial results of draining in this respect could be given, were it needful."

CHAPTER XI.

DRAINAGE PREVENTS INJURY FROM DROUGHT.

The year 1854, was a year of severe drought in the State of Ohio. But notwithstanding the drought there were some excellent crops grown in the State. Mr. Crosby, of Ashtabula county, states (under oath) that in that year he grew three acres in wheat, which produced thirty bushels per acre. Messrs. F. & W. Donaldson, of Clermont county, grew thirty-two bushels per acre. Mr. J. A. Webster, of Meigs county, produced thirty-six and one-third bushels per acre, on 4½ acres, and Mr. A. Edgel, of Washington county, produced thirty-eight and one-third bushels per acre, on three acres, while G. Dana & Son, of the same county, produced thirty-six bushels per acre on nine acres. These gentlemen have all made their statements under oath. In their account of culture they unanimously state that they *plowed deep*.

In the same year, Mr. Standiford, of Allen county, states that he produced ninety-four bushels of corn per acre; Mr. Chaffee, of Ashtabula county, ninety-two bushels; Mr. Hewitt, of Hancock, ninety-five and one-half bushels per acre, and Mr. C. Shepard, of Washington county, one hundred and eight bushels per acre. The statements of these gentlemen are subscribed under oath, and they all agree that they that season *plowed deep*.

"We recollect," says the *Genesee Farmer*, "walking through a magnificent field of corn on the thoroughly underdrained farm of our friend John Johnston. One of the underdrains was choked up, and *there the crop was a failure*. Corn delights in a loose, dry, warm soil. If it is surcharged with water, all the sunshine of our hottest summers can not make it warm, and all the manure that can be put on it will not make the corn yield a maximum crop. In passing along the various railroads, we have often been saddened to see thousands of acres of land planted to corn, which, by a little underdraining, would have produced magnificent crops of this grandest of cereals, but which presented a miserable spectacle of yellow, sickly, half-starved plants, struggling for very life. We have ever been willing to apologize for the shortcomings of American farmers. We know the difficulties under which many of them labor. We *do* believe them to be, as a whole, 'intelligent and enterprising.' But these sickly cornfields are well calculated to create a very different impression. We have frequently to repeat the German proverb—'to know is not to be able.' These farmers know how to raise good corn, but they are not always able to put in practice improved methods of cultivation. There is scarcely a plant which does not thrive much better in a loose, deep soil, than in a shallow, compact one; but in no case is this fact susceptible of more ready verification than in the corn plant."

One instance only may be cited to illustrate the effects of deep culture. There is in the immediate vicinity of Columbus a tract of "*Scioto bottom land*," which has for upward of forty years been cultivated in corn annually. In 1851, Mr. John L. Gill, of Columbus, anxious to test the effect of deep culture on corn, plowed eleven acres and about three-fourths, to a depth of about eight inches, with a double plow, and then followed with a subsoil plow, loosening but not turning up the soil to a depth of eight inches more. This tract, as well as the neighboring one, had never been plowed to a depth exceeding six or seven inches. In 1851, the neighboring pieces were plowed the usual depth, and the planting completed on the 7th of May; Mr. Gill completed the planting on the 10th.

In the course of three weeks the corn in the neighboring tracts appeared as forward and thrifty as usual, while that of Mr. Gill appeared pale and rather dwarfed; this, to say the least was rather discouraging. But in the month of July, that in the neighboring fields appeared to have come to a "stand still;" the leaves curled and drooped, and gave unmistakable manifestations of sufferings from drought, while Mr. Gill's was growing vigorously, and indicated no lack of moisture. The result was that Mr. Gill obtained 120 bushels per acre, while the adjoining fields yielded less than forty bushels per acre. This fact is well authenticated, and the field was witnessed in July and August by thousands of persons.

While the stalks in Mr. Gill's tract presented a pale and sickly appearance, the roots were pushing downward in search of moisture and nourishment; finding abundance of this, a sufficient supply was stored for the growth of the plant to resist all effects of drought. That in the neighboring fields exhausted the supply at first, and when the drought set in it had no store of supply to fall back upon.

If then deep plowing will secure a good crop in a period of drought, how much more may not be secured by underdraining?

The reason why drainage prevents injury from drought is to be found in the fact that draining "deepens the soil," and "lengthens the season." It is a well-known fact that a deep and mellow soil retains moisture much better than a shallow and compact one.

"'Water is held in the soil between the minute particles of earth. If these particles be pressed together compactly, there is no space left between them for water.' Compact subsoils are but little permeable to water, compared with the same when broken up, pulverized and mellowed. The one is porous and drinks in moisture like a sponge; the other absorbs it but in small quantities, and readily parts with the same on the application of heat. The one takes it from the air, which passes freely through it; the other, impervious to the air, or any slightly powerful influences, remains unchanged. Undrained soils, as we have shown, become compact after heavy rains, by the evaporation of the water with which they are saturated; drained soils, on the contrary, become more porous from the filtration of the same amount of moisture into the drains below.

"Draining prevents injury from drought, by giving a better growth to plants in the early summer. Seed sown on any soil containing stagnant water, sends no roots below that water line, but may for a while grow well from roots near the surface. But let drought come, the water line sinks rapidly, the roots having no depth to seek moisture below, are parched and burned, and without rain, the crop is irreparably injured. On a drained and deepened soil the roots go down without obstruction, and are thus prepared to withstand the effects of the long-continued dry weather so often experienced. That they will do so, a thousand facts in the experience of the farmer will prove to him that observes them."

A correspondent from Pittsburg, Pennsylvania, writing over the signature of B. B., to the *Country Gentleman*, in July, 1854, says:

"There are many portions of high ground in the neighborhood of Pittsburg, Pennsylvania, and along the Monongahela River, remarkable for its productive qualities. For many years past, it has been observed that those high hills, with ordinary cultivation, produce better crops of every kind, and grow superior fruit, to the bottom land in the same region. Many of the farmers would smile if told that the rich qualities of their land might be attributed to underdraining. The idea of draining hills from one hundred to three hundred feet elevation, they would consider ridiculous, from the fact that no swampy or moist land can there exist, and instead of attempting to drain it, some invention should be had to retain the moisture. This very invention they have in the most superior kind of underdraining."

"These hills comprise a portion of the coal region of Pennsylvania, and cover most generally two strata of bituminous coal. The first, about from thirty to sixty feet from the upper surface, from four to five feet in thickness; and the second, at the distance of about sixty feet beneath the first, of from five to seven feet in thickness. The first strata, upon account of its depth, as well as its quality, is but little worked at the present time, where the second is accessible; and in the immediate neighborhood of Pittsburg, where the first 'crops out,' the second alone is worked. From the quality of this coal, and the great demand for it in all parts of the country, an immense number of tuns are annually extracted—completely undermining many acres of surface, forming mammoth underdrains; and, as a number of acres are taken out, the whole hill is let down—not together in one mass, but broken and mangled by the pillars and supports left by the miners. So that, when the coal from any one hill is extracted and the pits abandoned, the soil upon its surface will have all the advantages of the best underdraining; and not draining of two or three feet in depth, but of from ten to an hundred feet; and, the ground being loosened to such a depth, it is almost impossible that it should suffer from drought. I have no doubt but this is one of the causes of the great crops on some of our hills.

"The drought at this time (July 17) is truly excessive, not a particle of moisture apparent in the ground to the depth of eighteen inches; and the summer thus far has been so dry as to almost check the entire growth of all kinds of spring crops. The farm I cultivate consists of about forty acres, all of which, excepting about ten acres, is undermined and underdrained by the taking out of the coal to the depth of from ten to one hundred feet. My crop of hay above the undermining has averaged over two tuns to the acre, while a 'rich bottom' of one of my neighbors did not produce one half the quantity.

"Again, I have planted upon the underdrained portion about three acres of corn, and on the same place, below the draining, in a rich garden, deeply spaded, there is planted a bed of the same kind of corn. The latter has received careful garden culture, and the former, planted on clover sod, the common field culture. The first looks as if it wanted rain badly, but still has a good color and healthy appearance; but the leaves of the latter look more like torches or fancy cigars, so closely have they wrapped themselves up, than any growing vegetable. The product of hay, as well as the present appearance of the corn, can be, partly at least, attributed to the underdraining.

"These advantages are still more apparent upon the growing of fruit. Formerly the bottom land was always sought after for gardens and orchards. A few years since an enterprising man fixed upon the top of one of our highest hills (Mount Washington). He now brings the first, largest and best fruits to market, and gets the highest price. *His land is undermined*, and I understand he attributes his success greatly to this fact."

Another correspondent says:

* * "Last spring I was induced to undertake a trial of underdraining in my garden. The soil was originally pretty hard clay, though it has been made lighter and more friable of late years by additions of muck, chip-dirt, manure, etc. The time for making garden being close at hand, and the materials not being conveniently to be had, I was able to drain only about half of my garden, and I was thus, though unintentionally, provided with the means of comparing contiguous portions of similar land, one portion being drained and the other not. The portion that was drained was obviously superior to the other in several respects. 1. It was sooner dry or in a condition to be worked than the undrained. In this respect the draining has, both last spring and this one, made my clay-soil garden almost as early as those on sandy soils. This I consider a great advantage, as it enables me to get in seeds a week or two earlier. 2. During the long term of dry weather last summer, the things growing upon the drained portion did not suffer so much, in the way of being wilted, pale and stunted in growth, as the plants did on the undrained section. I had thus occular demonstration that drained land will suffer less from drought than undrained. 3. In the case of a few crops which I raised on both portions, for the sake of comparing them, I made myself quite sure that on the drained portion the peas, etc., ripened a few days earlier, and were a little plumper or better than the same crops from the same kind of seed, and with the same kind of treatment, on the undrained."

"In the long drought of 1854, in New England, a pertinent case is mentioned, where two neighbors farmed adjoining fields precisely alike, with the exception of depth of plowing. One plowed four inches deep, and grew oats weighing but seventeen pounds per bushel; while the other, plowing nine inches deep, raised oats weighing thirty pounds per bushel. The proper depth of plowing depends, we think, considerably upon the character of the subsoil, and the condition of the land as to drainage. A porous subsoil would admit of the rising of moisture from below, while a hard pan or clayey soil would need to be plowed to a greater depth, so as to prepare it for taking all possible aid from slight rains, the dews, and the moisure of the air. A well-drained soil would present the same general characteristics of one with a porous subsoil."

"At a Legislative Agricultural Meeting, held in Albany, New York, January 25, 1855, 'the great drought of 1854' being the subject, the secretary stated that 'the experience of the past season has abundantly proved that thorough drainage upon soils requiring it, has proved a very great relief to the farmer;' that 'the crops upon such lands have been far better, generally, than those upon undrained lands in the same locality;' and that, 'in many instances, the increased crop has been sufficient to defray the expenses of the improvement in a single year.'"

"A committee of the New York Farmers' Club, which visited the farm of Prof. Mapes, in New Jersey, in the time of the severe drought, in 1855, reported that the professor's fences were the boundaries of the drought, all the lands outside being affected by it, while his remained free from injury. This was attributed, both by the committee and by Prof. Mapes himself, to thorough drainage and deep tillage with the subsoil plow."

CHAPTER XII.

DRAINAGE IMPROVES THE QUANTITY AND QUALITY OF THE CROPS.

That drainage increases the quantity of the crops, is confirmed by every one who has practiced it to any extent. The writer of "*Talpa, or the Chronicles of a Clay Farm*," states that underdrainage increased the products of a heavy clay farm 27 per cent. Almost all English writers on drainage agree that thorough drainage increases the products to such an extent that the net increase alone, in two or three years, is sufficient to pay all the expense incurred in underdraining. The instances on record demonstrating the increase in crops by underdraining, are sufficiently numerous to make an ordinary-sized volume. From the mass of them we select the following, from England, Germany, and several States in the Union, in order to show that climate and culture have not played so important a part in connection with drainage as some have intimated. Much, very much, is due to culture, but more in many instances, is due to underdrainage; because the best of culture on a stiff clay soil will not produce as great a result as will underdraining.

In the first volume of the *Royal Agricultural Journal*, p. 31, Sir James Graham, bart., states that "a field which he took into his own management was let at 4s. 6d. per acre; it was pasture of the coarsest description, overrun with rushes and other aquatic plants. After draining and subsoil plowing, at an outlay of £6 18s. 4d. per acre, it was let to the in-coming tenant, on a fourteen-years' lease, at 20s. per acre—yielding an annual interest of rather more than 11 per cent. on the outlay." In vol. 2, p. 276, Mr. J. Burke states that "Mr. Denison, of Kilnwick Percy, purchased about 400 acres of rabbit warren, of an apparently sterile sand, with a heavy ferruginous subsoil; the hills covered with heather, and the hollows with a bed of marshy aquatic plants; and of which the cultivation had been abandoned, as it was found, although parched and burnt, not to produce more than three quarters per acre of oats, and was let at 2s. 6d. per acre. After having been subsoiled, plowed, and drained with tiles and soles, at a cost of £5 4s. 8d. per acre, exclusive of the carriage, and manured in the common way, it produced ten and a half quarters of Tartarian oats per acre, and now bears wheat and oats, on a property which was formerly considered useless."

It is also stated in the same page, "that some land belonging to Rev. Mr. Croft, of Hatton Bushell, which was not worth 5s. per acre, is now let at 21s., evidently from the effect of drainage, and by the breaking up of the moor pan."

In the succeeding pages he continues: "I have, moreover, the authority of the Marquis of Tweeddale for stating that the increased product of his home farm at Yester, in Scotland, has been nearly two-thirds on most of the crops, and in some cases much more, upon all the land which has been subsoiled and drained. One field, indeed, which his lordship declares to have formerly carried only 17 bushels of oats per acre, has given 67 bushels of barley, after having been trench-plowed and drained." He goes on to state: "These improvements, by means of drainage, although clearly evincing its importance, both to the landlord in the increased value of his property, and to the farmer in the production of his crops, are yet less decisive than what I shall here briefly attempt to describe. The extra-parochial place of Teddesley Hay, in Staffordshire, is the residence of Lord Hatherton, and contains 2,586 acres. It was originally part of the forest of Cannock, and, with the exception of two anciently inclosed parks, it continued uninclosed until 1820, when the whole became, either by allotment or purchase, the property of his lordship. The extent of the farm lands is 1,832 acres, comprising a range of high and dry hills to the east, adjoining Cauk Chase, which hills were formerly a rabbit warren, covered with heath or fern. Having heard this tract of land below the hills mentioned as exhibiting in a striking manner the results of judicious draining, and employment of the water so obtained, I visited the place, in the latter end of May, 1841. I was conducted over it by Mr. Bright, the respected land steward, who gave me the following statement; and in riding through the farm, which then presented the appearance of the most luxuriant vegetation, described to me the condition of the land in 1820. The larger park, which had been long divided into fields, was ill cultivated, and the lesser park might be fairly viewed as one bed of rushes, and the lower parts alder; the whole consisted generally of a light soil, rather inclined to peat, the subsoil being chiefly a stiff clay.

"Some very deep drains were made in the larger park, which was effectually drained, and from which large volumes of water now issue; as soon as the inclosure was completed, other deep drains were made, and for the most part with excellent effect; things were in this state when Mr. Bright became agent to Lord Hatherton; he immediately conceived the notion of putting a portion of the waste allotments, and the whole of the lesser park, containing a surface of nearly 600 acres, through a regular course of thorough drainage, and afterward collecting the whole of the drain water into two main channels, with the double intention of conducting one of them through the farm-yard, for the purpose of obtaining by it a water-power for various objects with the estate, and then employing it, in conjunction with the other stream, in making an extensive tract of upland water meadow. It must, however, be acknowledged to have been a bold attempt, which could only have been conceived by a comprehensive mind, and a man of great practical knowledge; but it was liberally seconded by his noble employer, and has been accomplished with admirable success as the following statement of the improvement by drainage, and the expenditure during ten years preceding 1841, upon such parts of the estate as have been drained, will sufficiently explain. The original value of 467A. 0R. 9P. was £254 10s. 9d.; expenditure, £1,508 17s. 4d.; improved value, £689 13s. 1d.; showing an improved annual value of £435 2s. 4d. These lands having been effectually drained, Mr. Bright's next object was to collect so much of the drain water as the levels permitted into two main carriers, for the purpose of employing them as a power to turn a mill-wheel, and afterward to be employed in irrigation. For the former object, a small reservoir has been constructed, at a favorable level, about half a mile distant from the farm; here, at the farm-yard, a mill has been built, which does infinite credit to Mr. Bright; the stream of water was, of course, not sufficiently powerful to turn an undershot wheel, and to enable it to act with force, it was necessary to bring it out to the upper part of a wheel of thirty feet diameter; this wheel has been placed in the rock thirty-five feet deep, and the headway has been carried from the bottom through the rock, and comes out in a valley below, at the distance of 500 yards. The mill and this channel for the water costs very little more than £1,000; it works a threshing machine, cuts hay and straw, and kibbles oats and barley for the stock, consisting of about 250 horses and cattle, grinds malt, and also turns a circular saw, which does a great part of the sawing for a large estate. The annual saving by this machine has been estimated at about £400, and it is still intended to apply the power to other purposes. From this wheel, and from another small carrier, which is made to pass immediately under the farm-yard (where all the urine and moisture that runs from the manure is carefully collected in a reservoir which overflows into the carrier), the water has been conducted over lands, principally uplands, containing altogether eighty-nine acres, at an expenditure of only £224 4s. 10d., by which an improvement of £2 per acre has been effected, or £178 per annum. This is Mr. Bright's calculation, but it is difficult to estimate the importance of such an acquisition as eighty-nine acres of productive water meadow to a large farm like this, on which there is (especially on the upper part of it) a great quantity of very dry and thin soil. I know no other place in which drain water has been turned to such good account. Luckily the water is all soft, and good for irrigation:

TOTAL INCREASE IN VALUE COLLECTED.

	£	s.	d.	£	s.	d.
Lands underdrained, present value	689	13	1			
Original value	254	10	9			
				435	2	4
Estimated saving by mill				400	0	0
Increase in value of water meadows				178	0	0
Being an increased value of				£1,013	2	4

Resulting only from draining 467 acres, and employment of the drain water over 89 acres of land; affording a clear annual interest on the outlay of full thirty-seven per cent., as will be seen by the following

SUMMARY OF TOTAL EXPENDITURE.

	£	s.	d.
Underdraining, as per statement	1,508	17	4
Erecting wheel and machinery	1,000	0	0
Irrigation	224	4	10
	£2,733	2	2

Mr. Herman Wauer, a draining engineer in Prussia, says, in his work on drainage: "Two years ago I underdrained a plat of 37 acres of sandy clay, at an expense of 324 thalers ($216 U. S. currency). The two years preceding, the potato crop was so badly rotted that it did not pay the expense of planting and harvesting. The year preceding the draining, it was put in rye and produced the miserable amount of 5 bushels per acre, and half of that was chess and cockle. After it was drained it was sowed in oats, and produced 900 bushels of oats, which were sold for 500 thalers ($333 33). The next year it produced 5,400 bushels of potatoes, which were sold for 1,500 thalers ($1,000). The present year (1859) the crop of barley which it produced was excellent, but as it is not yet threshed I cannot give the figures. The clover which is now appearing on it gives promise of a very heavy crop."

But the most remarkable example of the increase of crops by drainage is that of a domain in Hanover. A tenant leased it in 1844. The tract contained an area of 3,000 acres of heavy wheat land—all of it in an arable condition—and, notwithstanding the rent appeared to be very low, yet several successive tenants became bankrupt on it. But the last, or new tenant, was an intelligent agriculturist, who had thoroughly studied and learned how to drain in England, and he saw at a glance what was necessary to produce good crops. He employed a drainer, and in the course of several years underdrained the entire tract, and, as he held the lease for some years, accumulated an ample fortune on it. There was one tract on this domain of 82½ acres (110 morgen) which gave the following results:

In 1842 it lay fallow, because it was too wet to work in seeding time.

In 1843 it was sowed in vetches, but, as the excessive moisture destroyed most of these, they were plowed down, the land manured, and rape was sowed. This crop, in 1844, scarcely paid for seeding and harvesting, having been badly "winter-killed" and soured. It was then drained, and produced the following increased crops, as the direct result of drainage:

In 1845	it produced	1,944	bush.	wheat,	worth	4,860	thalers.........	($3,240 00)
1846	"	1,008	"	peas,	"	1,400	"	(933 33)
1847	"	1,872	"	rye,	"	4,992	"	(3,328 00)
1848	"	2,304	"	oats,	"	896	"	(597 00)
1849	"	8,568	"	potatoes,	"	3,570	"	(2,380 00)

I have been unable to procure returns of the subsequent crops. The tile were brought from England, and this, of course, enhanced their cost. They cost, delivered on the domain, 25 thalers for morgen ($22 21 per acre), in the aggregate $1,833. It will be seen that the increased amount of the first crop was almost double the entire expense incurred in underdraining.

This is, perhaps, the most remarkable case on record of increased productiveness in consequence of underdraining.

The following was communicated by Mr. James M. Trimble, of Highland county, Ohio, to the *Ohio Farmer*. The farm on which the mole plow, or ditcher, was used is situated in Fayette county, Ohio:

"Mr. Johnston's answer to my letter of inquiry, published in the *Farmer*, did not reach me until I had purchased the implement, with the right to use it; else I should have hesitated, and, perhaps, not bought it. Having witnessed the operation of the ditcher, drawn by a pair of cattle, cutting at the rate of 125 rods of ditch, 3 feet 4 inches deep, in a single day; comparing this work with friend Johnston's statement of a 20-horse power engine being required to operate it, I came to the conclusion that my friend, in his great zeal, as the advocate of tile drainage, could not appreciate the mole plow as a substitute. This, coupled with the cost of tile drains, on a farm of over 1,700 acres, four-fifths of which requires underdraining, determined me from the use of tile, and induced me to give the mole plow, at least, a fair trial, before throwing it aside. To accomplish this, I purchased an accurate instrument to begin with—an engineer's level—and with it ascertained the level of the land to be drained.

"The farm lies on Rattlesnake, the creek running through it from north to south, parallel with and at 75 rods from the east, and 350 to 400 rods from the west line of the survey. There being but little fall to the creek, and the banks low, I had some difficulty in procuring the necessary fall to my open drains, to give a free outlet to underdrains, confining my operations to some 230 acres of prairie land on the west bank of the creek. I laid out my open ditches from the creek west, staking them off at every six rods, and marking the depth of cut and width of ditch on each stake. In this way I laid off 685 rods of open ditch, at 80 rods apart, varying in depth from four to six feet, and in width from six to eight feet, allowing for slope of banks one and three-fourths feet to one foot in hight, which was let by contract at 65 cents per rod, and finished in October, 1858. The underdrains were cut in March, April and May. My son superintending the work, he laid off his drains with the level, staking them off more with the view of tapping the wettest portions of land between the open ditches, than a regard to straight lines or thorough underdraining. In this way, with the ditcher, two yoke of cattle and two men, in 16 days, he put in 1,500 rods of underdrain, at a depth of three feet four inches, and a cost of $65.

"At the time of running the mole plow, the surface of the ground was covered with water, from one to six inches deep. The surface soil, to the depth of from one to two and a half feet, is a black clay, or loam, rather a compact, tenacious soil; the subsoil is a close, compact, yellow clay, to the depth of from three to five feet. We followed the ditcher, with a large Illinois sod plow, a steel plow on wheels, drawn by three yoke of cattle, one of Garrett and Cotman's steel sod plows, a No. 8, drawn by three horses, and four steel sod plows, same make as No. 4, with a pair of horses each, and broke the sod up from six to eight inches deep, turning the furrows flat, which was first harrowed—200 acres of it—with the furrows, and then crosswise. It was then marked out, four feet apart, and with Brown's Illinois corn-planter planted in corn, checkered so as to be cultivated both ways. During the time of planting we broke some 30 acres which had been partially underdrained; the sod being tough and the ground very dry, it broke up rough and uneven—so much so that it was planted (without harrowing or marking out) about the 2d to the 4th of June.

"Our first planting was finished the 23d of May. On the 4th of June it was up (with the exception of what the cutworms destroyed), and from six to sixteen inches high. The frost on the morning of the 5th laid it all level with the ground. The largest corn seemed to be most injured; and on the 6th the work of plowing up and replanting was commenced, and continued until the 200 acres were all replanted. The crop was worked three times over with double shovel plows; the fourth and last time with single shovels. The 30 acres last planted were not cultivated in any way. The weather, from May 23 to September 10, was warm and dry—not to exceed half an inch of rain fell during that time. The corn was all cut up and put in shocks twelve hills square, making about 23 shocks to the acre. We have husked over 100 shocks, and feel confident that the entire crop on the 200 acres will average 60 bushels per acre; and the 30 acres not cultivated will yield 40 bushels per acre. The underdrains all performed their work well up to the middle of July, when they began to fail, and by the 1st of August were perfectly dry. I have been on the farm from the 3d up to the 25th of November, during which time we have had several hard rains; and I have examined the outlets to all of the underdrains, which, without a single exception, are passing off large quantities of water. From a close observation during the summer, I am satisfied that the underdrains were quite as important to the growing crop during the drought, from May to September, as they were in carrying off the surplus water in the spring; and I am equally certain that the increase of crop, resulting from draining, is all of 20 bushels per acre, which would leave the account stand thus: 685 rods open ditch, at 65 cents per rod, $445.25; 1,500 rods of underdrain cost $65; use of ditcher, wear and tear, $25.75; entire cost, $536. Cr., by 20 bushels of corn, on 230 acres, give 4,600 bushels, at 25 cents, $1,150, showing a profit of $614 in favor of the mole plow, in a single year. It would seem superfluous to give the details of so plain an operation, as I have done; yet I am aware of the fact that, in many instances, in the immediate neighborhood of my farm, the use of the mole plow has been condemned, from the fact of improper use, not procuring sufficient outlet, running the ditches too shallow, and failing to reach the clay subsoil with the mole. I have no faith in the use of the implement without a clay subsoil for the mole to operate in; otherwise, the aperture made by the mole will cave and fill up. I have purchased an additional ditcher, and intend to carry on my operations until I have underdrained my farm—at least, all that portion requiring drainage."

Mr. Nathaniel Spalding, of Vermont, purchased a small farm, consisting of twenty-five acres, brook meadow, of clayey soil; some part of it approaching to swamp muck; and 17 acres upland, of cobble stone surface, in wood and pasture—42 acres in all. Mr. Spalding said that he bought it at auction, and moved on to it in 1853—price $460. "An old shell of a house and barn" (to use his own expression) was then upon it, "and some parts of the meadow so wet that a team could not be driven over it to get what little poor hay grew upon it." There was but little of it that could be plowed to advantage. From eight to ten tons water grass of poor quality was the produce of the first year's hay crop. Mr. Spalding says he has made over 600 rods of drain. Main ditches, three feet wide, and from three to six feet deep; the bottoms of the drains are boards; space 12 inches square, covered with flat stones, with shavings from the lumber with which he was erecting new buildings, and hemlock brush, thrown into the drain upon the covering stones, and then filled with earth. The cost of these main ditches averages 62½ cents per rod. His cross drains, leading into the main ones, are four rods apart, 15 inches wide, stones (cobbles) thrown in loose, covered with brush, and filled with earth. The cost of these cross drains, 30 cents per rod.

Mr. Spalding thinks the increase of production for the two years following the draining, paid the whole expense of making these drains. He is undoubtedly correct in his estimates, for this work was performed by himself and boys. Had he employed other labor, or contracted it out, at the high prices farm labor has commanded of late, it would hardly have done it; but he is a man that never puts his hand to the plow and looks back. He is emphatically a practical man, carrying out whatever he undertakes with an energy and skill known to those only of like determination. Above these drains where clover and timothy now grow so heavy as to lodge, a poor miserable water grass grew, scarcely worth the cutting and housing.

Mr. Spalding says the production of these 25 acres in 1857, only four years from the time he commenced on the farm, was 30 tons English hay, 350 bushels of corn, and 250 bushels oats. And this from a soil, though not exhausted, but so located as to be kept saturated and filled with cold spring water, to such a degree as to discourage and forbid cultivation only on the driest parts and in the driest season.

We found the following in "a paper," without credit, but presume it was written by Luther Tucker, of the *Country Gentleman:*

"We wish to give additional evidence to the value of underdraining, by reporting all accurately stated experiments. Having recently made some on a small scale, we add them to the list. The land is a strong loam in Cayuga county, a medium between a heavy clay and a light loam. The drains were cut two feet nine inches to three feet deep, two rods apart, and completed with tubular tile two inches in diameter. The work being done where the proprietor could not oversee it, cost 40 cents a rod, or $32 per acre.

"The crops on this drained land, the present season, were corn and spring wheat, and being cultivated by a tenant, did not, of course, receive the best treatment. A portion of the cornfield was on a strip of undrained land. The season proving unusually favorable for the latter, but little difference could be perceived till the ears had set. It is now found, however, that while the corn on the drained land is at least forty bushels of sound shelled corn per acre, the undrained portion yields scarcely thirty bushels, and of poorer quality.

"With the spring wheat (China Tea), however, the disparity is greater. Before draining, fifteen bushels per acre was regarded a good crop, and uncertain at that. Three scant acres were sown last spring on the tile-drained land, and yielded *eighty-one* bushels—equal to twenty-seven bushels per acre. The wheat sold promptly for a dollar per bushel, and would probably have brought more as seed, as it was unusually fine, weighing 62 lbs. to the measured bushel.

"The time required to repay the cost of draining would, therefore, be as follows: For the corn, the increase being ten bushels per acre, at seventy-five cents per bushel, four years would be required, if all the seasons were like this. But they are commonly more unfavorable—making a greater difference in favor of the drains; the best cultivation would doubtless place the time for full repayment within three years. The increase of spring wheat being twelve bushels per acre, at a dollar per bushel, repays the cost in less than three years."

It is the unanimous opinion of all who have observed closely, that the plants and fruits grown upon underdrained soil are more fully developed, and of much better quality, than those grown on undrained soil.

CHAPTER XIII.

DRAINAGE INCREASES THE EFFECTS OF MANURES.

It has been demonstrated that dew, rain and snow carry with them certain fertilizing agents of great importance to vegetation, such as carbonic acid, nitric acid, and ammonia, or these combined, as carbonate or nitrate of ammonia. When the soil is in a condition to receive all the water that falls upon it in the form of dew, rain or melted snow, these fertilizing agents are carried into the soil and immediately absorbed by it, or at once appropriated by the growing crop. When the soil is already saturated by water, or of a close, impervious character, or when the surface is sufficiently inclined, the water is compelled to run off, and carry with it, whatever elements of fertility it contains. Sandy soils readily receive water, but do not as readily absorb gases as soils containing clay or peat. Clay lands thoroughly drained and deeply tilled, will receive almost any amount of water, and absorb and hold for the future use of plants, all the gaseous fertilizers the water contains. The amount of these fertilizers brought down by the rain, differs greatly under different circumstances. The quantity of ammonia is found to be much greater near cities than in the open country. The amount of nitric acid is greater after thunder storms, and in seasons when thunder storms are frequent, than at other times.

It has been asserted (but at present appears to be a controverted point) that the elements of manure act upon plants only in a state of solution; hence it is of the greatest importance that they be so applied, and that the soil be so prepared that they may not only be readily dissolved by the rain, but that the rain may freely pass through the soil, which, acting as a filter, arrests and holds these elements where they best serve as food for vegetation. On undrained lands the rains dissolve the essential portions of the manure and carry them off, or if lands are more than ordinarily wet, it prevents the rotting of the manure. Herman Wauer mentions an instance where sheep droppings were kept from rotting by moisture for the space of five years. This is one great reason why manures produce such trifling results on heavy lands, especially in seasons of abundant moisture. In very dry weather but little more effect follows their application, from the want of a solvent, such as is ever supplied by the water retained in mellow, porous earth.

"'Draining renders the land penetrable to water,' says a writer on the subject, 'enabling the rain to descend freely through it, carrying to the roots the fertilizing elements with which rain water is always charged,' as well as those it takes in solution from manures. The effect of manures is also much increased by an intimate mixture with the soil. Such mixture can be but imperfectly obtained in the case of hard and shallow land, either in a wet or dry state. It will always be found that mellow and friable soils receive most benefit from manures, and that clayey soils, if made mellow by draining, possess the greatest absorbent powers, and are of the most productive character, compared with sandy and light or mucky loams.

"The true policy of the farmer is to use every means in his power for rendering his labor more effectual, and his farm more fertile, and in no way can this be better accomplished in the case of wet and retentive lands, than by *draining*, and thus deepening and increasing the productive powers of the soil."

Water from drains has repeatedly been collected and analyzed, and that under all imaginable differences of condition. These examinations have been made for the purpose of determining to what extent the water of drainage does bear away with it the fertility of the soil. It is found that drainage water does carry off, in solution, in appreciable quantities, the mineral constituents of soils, that it would be desirable to retain. As might be expected, the amount of loss varies greatly in different circumstances; from sterile lands, the amount of nitric acid, or ammonia, is less than what is furnished in the rain and snow; while on highly manured lands the amount of loss will exceed what is obtained from the atmosphere. From lands well tilled, and in a perfectly friable condition, the loss is greater than from lands imperfectly tilled. Where a crop is growing upon the soil, ready to appropriate whatever is presented in the water passing through the soil, less of these gases escapes than where the ground is fallow. The amount of loss is also found to be much less where the drains are deep, than where they are shallow. Some of the conclusions arrived at, on this subject, are: That there need be no fear that underdraining will rob the soil of its fertility, because the rain, which would run from the underdrained lands and be lost, will either wholly or partially compensate for any loss that occurs through the drains—that there is no method, except by drainage and deep culture, by which stiff, clayey lands can be made to appropriate all the elements of fertility furnished by the atmosphere—that it is better not to manure excessively, at long intervals, because a part of the unappropriated manure will probably be washed through the soil and lost, and, therefore, it is better to apply manure as it is required to meet the present demand. Manure is better applied in a liquid state, for if the soil be dry and deep, and therefore in a good condition for absorbing manure, it will combine with the elements of the soil at once, and the surplus of water will run from the deep drains perfectly clear and inodorous. It is better never to permit naked fallows on such lands, because the soil will be losing more through the drain than it gains from the atmosphere; and much more than it will lose, if covered by a growing crop; but on poor, clayey soils, the case is the reverse; and it is possible for such soils, while undergoing the comminution and exposure of fallowing, to gain more from the atmosphere than they would probably lose from the drains. The loss of any fertilizing agent by drainage is wholly avoided, however, in countries where drainage and irrigation are properly and systematically combined. The waters from manured and tilled lands, being conducted over the meadows below, yield up whatever of fertility they have brought with them, and thus nothing is lost.

CHAPTER XIV.

DRAINAGE PREVENTS RUST IN WHEAT AND ROT IN POTATOES.

The wheat growers of Ohio have often had the misfortune to see that which promised a bountiful harvest suddenly blighted by mildew or rust. In regions where a gravelly subsoil is found, the wheat crop seldom suffers from rust; but the wheat is frequently "rusted" on gravelly soils which rest upon *hard pan*, or impervious clays. Rust or mildew also most frequently attacks wheat on bottom lands, where considerable moisture prevails.

In all our reading and observation we have never heard nor seen a well-underdrained field of wheat attacked by rust, and therefore infer that drainage acts as a preventive of this very undesirable phenomenon.

A series of experiments made in 1857, by H. B. Spencer, of Rockport, Cuyahoga county, proves almost conclusively that the rot in potatoes is due to excessive moisture. We know numerous instances where potatoes, grown on ground having a northern exposure, were sound on the most elevated portions of the field, but badly rotted on the lower or most moist. One instance we remember more particularly, where the potatoes on the hillside were all sound, and on the bottom or swale they were not worth digging. No case of potato rot on well-underdrained ground has come to our knowledge. From this fact, and from Mr. Spencer's experiments, we are inclined to believe that underdraining will prevent rot in potatoes.

The fact that drainage lengthens the seasons, will permit wheat to be sown later in the fall, and thus avoid the ravages of the Hessian fly *(cecidomyia destructor)*, and as the wheat will vegetate more rapidly and ripen earlier in spring or summer on underdrained ground, therefore the ravages of the "midge," "fly," or "weevil" *(cecidomyia tritici)*, will be greatly lessened, if, indeed, not entirely prevented.

CHAPTER XV.

OTHER ADVANTAGES OF DRAINAGE.

Drainage is of great advantage in many other respects; among these it may be stated that

Drainage facilitates Pulverization.—One object of plowing land is to pulverize it, and render it workable. Every one knows that a wet soil can never be pulverized, and plowing a clayey or loamy soil, when wet, does, perhaps more injury than if it were not plowed at all, because, if plowed when wet, the soil is pressed together, and is turned over by the plow in almost unbroken slices, which become very hard clods when dry, and render it difficult of culture. Pulverization of the soil is so essential that, more than a hundred years ago, Jethro Tull advocated the idea that complete comminution or pulverization of the soil was a complete substitute for manure. In fact, the little book recently published by a London house, entitled "*Tillage a Substitute for Manure*," is made up mainly from the writings of Jethro Tull. The *Lois Weedon* system of culture, by which more than a dozen successive good crops of wheat were harvested from the same piece of ground, is simply another application of the principle advocated by Tull; and, while this system is not drainage in a direct sense, it undoubtedly partially answers the purpose of drainage. Cultivating to the depth of three feet, as the Lois Weedon system requires, must certainly lower the water line, and thus consummate *one* of the objects of drainage. The deeper any soil is cultivated, the better will it produce.

If the water is withdrawn from the soil, teams can pass over it with less injury to the soil than on that which is not underdrained. The undrained clay, when tramped by cattle pasturing, or by being frequently hauled over, acquires a consistency to hold water, from which underdrained land is exempt. It is a common practice to haul manure either in the winter or early in the spring, and, in many instances, as much injury is done to the land in hauling as the manure benefits it.

Drainage prevents Surface Washing.—Many plowed fields, especially where the land is rolling, suffer greatly in spring and fall time, from "*washing*" by heavy rains. On drained lands, the rain is at once absorbed, and washing is thus prevented.

CHAPTER XVI.

WILL DRAINAGE PAY?

1st. *For the Garden.*—With regard to lands designed for garden uses, that have a compact subsoil, there cannot be a doubt of the economy of underdraining. Earliness and depth of soil are essential to a good garden; and in many localities these conditions cannot otherwise be secured. Drained lands freeze to a greater depth than the undrained, but they are much sooner dry and fit for working, or for seed, in the spring. And during the summer, however wet the season, or recent the rain, the underdrained land may be worked so soon that the weeds do not necessarily get a start.

Ground that is made dry underneath may be cultivated to any desired depth, and may then be brought to any degree of richness, without the bad effects that sometimes follow excessive manuring on shallow soils; and the deeper the soil is stirred, the less injury is sustained from drought. The expense of draining a garden thoroughly is, therefore, a mere trifle, compared with the benefits that may be obtained from the outlay.

2d. *For Nursery Uses*, the soil must be susceptible of deep, early and frequent tillage. These conditions can only be secured on lands having a loose subsoil, or such as have been well drained. When drainage is necessary, the outlay of $20 or $25 an acre will be more than returned in a single season.

3d. *The Orchard* will pay as well for drainage as the garden. The necessity of dry land for the orchard is so generally admitted that the highest and driest parts of the farm are almost everywhere selected for this purpose. Orchards planted on river bottoms, in preference to clayey uplands, are no exception to this; for the bottoms, besides having the deepest soil, have the loosest subsoil, and are consequently driest underneath. Apple trees, planted over a subsoil that is for a large portion of the year saturated with moisture, are never thrifty, productive or long-lived. Of the various expedients that may be employed to secure the growth of an orchard on wet land, the cheapest and most reliable is underdrainage. The drains should be about three feet below the surface, and midway between the rows of trees; if they are more directly under the trees, the roots find their way into the drains and ultimately close them. In preparing for an orchard, it is desirable to subsoil the ground as deeply as possible across the drains before planting The whole expense of such preparation is so inconsiderable, compared with the value of one year's produce of a good orchard, that, even without taking into account the increased longevity of the trees, there is no question about the profitableness of underdraining.

4th. *Tilled Lands.*—There are two principal advantages derived from the thorough drainage of tilled lands. The first is, the lengthening out of the time in which work may be done, because the drained lands may be plowed so much sooner than the undrained. But the chief benefit is the increase of the crop. In Old England the average wheat crop has more than doubled since draining was undertaken in earnest. Results equally favorable, though on a smaller scale, have been obtained in the State of New York, and also in Ohio. This increase depends not so much on larger crops than were ever grown without drainage, but in lessening greatly the causes of failure, so that a fair crop is much more certain. Where the expense of drainage is $20 or even $25 an acre, an increase of four or five bushels of wheat to the acre on every crop, or of ten or fifteen bushels of corn, would make the drainage an excellent investment—far better, indeed, than money loaned at ten per cent. per annum. But this is not the principal advantage; for on drained lands a good crop of grain is often grown, while on adjoining lands, precisely similar and with the same tillage, the crop is a failure, so that the difference in one year has exceeded the whole expense of the drainage. There is another fact, also, worthy of mention: the quality of wheat and other grains is greatly improved by the steady growth which good drainage secures, the grain being uniformly plumper, thinner skinned, and therefore heavier.

5th. *Grass Lands.*—It is desirable to have pasture lands sound and dry, and fit for the tread of animals as soon as the feed starts in the spring. It is equally desirable to have grasses root deeply, so as to escape the influence of summer droughts. It is also advantageous to have lands in such a condition that they will produce a variety of grasses, which, by their different periods of ripening, will keep the pastures fresh through the entire season. Orchard grass and red clover will not prosper unless the soil be dry and loose. In meadows that are too wet, the red-top will gradually take the place of timothy, and what is still worse, wild and innutritious grasses will take the place of all the cultivated kinds.

It is doubtless true that grass will grow upon land too wet for any other purpose, but it is a great mistake to suppose that land cannot be too wet for grass. The best varieties of grass, the heaviest crops of hay, and the most uniformly fresh pastures, are to be found on soil properly drained. But will it pay to incur an expense of $20 an acre for these advantages? The dairy farmer can readily see that it will pay, if, by draining a piece of wet clayey land, and afterward subsoiling and seeding with orchard grass and clover, he can thereby secure a month's pasturage in the spring, before the grass has started elsewhere, and fresh green feed through the months of July and August, while other pastures are all dried up. Good pasturage at such times is certainly worth more to the dairyman or any stock farmer than the annual interest on the money expended for the improvement.

It is cheaper to increase crops by drainage than by the purchase and cultivation of additional acres. Drained lands pay no more tax, cost no more fencing, and require no more labor than the undrained. When the cost of drainage has once been paid, the increase of crops involves no new expense, as would necessarily be the case if the same increase were obtained from the cultivation of more land.

Some may be inclined to defer this work of drainage until tiles can be obtained at lower rates. It is probable that tiles will be cheaper and more readily obtained in a few years, but this will only happen if a good demand for them is established. The true way to have tiles cheaper is to begin to use them wherever it will pay at present prices. An increased demand will probably secure a better supply and at lower rates.

CHAPTER XVII.

WHAT LANDS NEED DRAINING.

1. *Low Places, Swamps, etc.*—Where the surface is depressed, and water is received from the surrounding lands, the necessity for drainage of some kind is obvious enough. This may be effected by open ditches; and these, perhaps, are the most economical, where the quantity of water to be disposed of is very great. But where ditches would be inconvenient, or gradually fill in by frost or the treading of cattle, or prove an eye-sore, underdraining may be substituted, and, if properly done, with the effect of converting a low place or swamp into a garden, while a single open

ditch up the center, which is the usual course, would have left the ground wet and cold; for if the water, in its descent from the higher ground, be but arrested at the edge of the low lands, by ditches or drains, it is compelled to traverse the low land tothe center ditch, and does its mischief before it can escape. Wet and swampy lands, when thoroughly drained, are found to be among the most productive, and hence their improvement by drainage is most marked and satisfactory.

2. *Springy Places.*—At the foot of hills, ridges and high lands, the water is often found, even in a dry time, oozing out, not, perhaps, at a single point, or in sufficient quantity to make a useful spring, but enough to make the land for rods or acres around, wet and cold, and worthless. In such situations a single drain, in the right place, is often sufficient to put an end to the mischief, and change worthless into fertile land. But what is oftentimes, and in many places, still a greater benefit, the water which before evaporated injuriously on the surface is collected by the drain, and made available at a convenient point for stock purposes, forming an artificial spring as durable and often more useful than those formed naturally. On farms as poorly supplied with stock water as many in Ohio, the drainage and improvement of all springy places should be effected without delay.

3. *Sandy or Porous Soils with Clayey Subsoils.*—Sandy soils, as every one must have observed, are not always warm and dry. There is sometimes found at the depth of a foot, or it may be of two or three feet below the surface, a layer of impervious clay, through which no water can pass, but on the top of which it must flow, if there be an inclination in any direction, with the effect of keeping the surface constantly damp and cold. In all parts of the State such lands may be found; they appear mellow and rich, but are always cold and weedy, and produce no valuable crop. They are much more easily and cheaply underdrained than clayey lands, because a different system may be pursued; and when drained, they soon lose all their disagreeable and unproductive qualities.

4. *Clayey and Impervious Soils.*—Clayey soils transmit water downward, but, slowly; and consequently, in a wet time, the surface soon becomes perfectly saturated with moisture. It is too wet for crops, too wet to till, too wet to bear the tread of animals; in short, it is too wet for anything. In drying, it sets hard, and becomes more unmanageable than ever; the roots of grasses or other plants cannot penetrate to any considerable depth, and clayey lands are therefore the first to suffer from excessive drought, as well as from excessive moisture; there is scarcely a season that exactly suits them, and only a limited portion of the best of seasons that they can be comfortably worked. When such lands are thoroughly drained, and at sufficient depth, the surface never becomes saturatad with moisture; and in drying it never sets hard. A deeper tillage becomes possible, and is indeed required to secure the full benefits

of the drainage. With the deeper tillage, the roots of plants enter the earth to a greater depth, and suffer less from drought. Clayey lands, when drained, can be worked at almost any time; they become more friable in texture, cost less in their cultivation, are suited to almost any crop, and retain their fertility longer than lands of almost any other description.

The writers on the continent of Europe on drainage attach great importance to plants, as being the best exponents of the quality of the soil, and of its condition. Herman Waner, in his work on Drainage, has compiled a list of plants, occupying nearly ten pages of his book. He states very positively that whenever any of the plants named in the catalogue occur in a field, in observable quantities, that that field requires drainage. Almost all the German works on drainage contain similar catalogues; these lists of plants have very little or no practical value in this country, from the fact that either we have many plants which do not appear in Germany, and which are equally as good indices as are those named by them, which do here; but upon the whole, not one-fourth of the plants named by these writers occur here, or else the nomenclature is so different that we have failed to recognize our plants in the lists.

We translate the following from Barrall's (France) great work (3 vols.) on Drainage:

"*External Signs of the want of Drainage.*—The aspect of the soil after heavy rains, or great protraced heat, the mode of culture and the nature of the vegetation are very conspicuous characteristic signs, by the help of which we can easily tell that a ground needs to be drained.

"Whenever after a rain, water stays in the furrows; wherever stiff and plastic earth adheres to the shoes; wherever the foot of either man or horse makes cavities that retain water, like so many little cisterns; wherever cattle are unable to penetrate, without sinking into a kind of mud; wherever the sun forms on the earth a hard crust, slightly cracked, and compressing the roots of the plants as into a vise; wherever three or four days after rain, slight depressions in the ground show more moisture than other parts; wherever a stick, forced into the ground one foot and a half deep, forms a hole like a little well, having water standing at its bottom; wherever tradition consecrated, as advantageous, the cultivation of lands by means of convex, high, large ridges; one may affirm that drainage will produce good effects.

"When water stands on the surface, after rain, or when it oozes from the inside, from below, as farmers say, there is no doubt that drainage will be the best improvement that can be made.

"In all the above cases, vegetation cannot easily take place; crops are scanty and often amount to nothing; the species of plants which find that kind of lands hospitable, signalize them spontaneously to the exercised eyes of an observing visitor; those parasitical plants are in possession of wet lands, and often expel therefrom productive vegetation; weeding is of no avail, drainage only can effect the cure and restore wholesomeness to the ground, and life to the crops.

"Upon the ground which was drained at the Agricultural Institute at Versailles (farm of the menagerie), and which is composed of green clay, of plastic and somewhat calcareous nature, our great botanist, M. Boitel, determined the nature of the indigenous growth which covered it; this nomenclature may be used as a pattern, and therefore we reproduce it. The number 100, in the following table, shows the most common kind; the other species have figures lower and lower, in proportion as they become more scarce:

Proportional figure.	Latin name of the species.	Vulgar name.
100	Juncus communis,	Common rush.
83	Plantago lanceolata,	Plantain.
67	Colchicum autumnale,	
50	Equisetum arvense,	
50	Ranunculus acris; R. bulbosus,	
50	Carex riparia,	
50	Hypericum tetrapterum,	
33	Ajuga genevensis,	
33	Cirsium palustre,	
33	Cardamine pratensis,	
33	Agrimonia eupatoria,	
17	Valeriana dioica,	
17	Caltha palustris,	
17	Rumex acetosa; R. crispus,	
1.2	Trifolium pratense; T. repens,	Clover.
0.8	Orchis latifolia,	
0.4	Anthoxanthum odoratum.	

Mr. Boitel adds: "The animals will readily eat the clover and the Anthoxanthum only. One sees in what proportion they are found in wet meadows. The other species are mostly of a nature not suited for forage, and characterize wet lands. The colchicum autumnale is known to everybody; from afar its leaves look like those of the large leek; its blossoms, of soft, lilac hue, are about three and a half inches long, and make their appearance during autumn, after the fall of the leaves; its fruit winters in the ground; in the springtime the fruit stretches out and sprouts, surrounded with large, compressed leaves; it is a plant very poisonous, which cattle are careful not to touch; they eat it, nevertheless, at the stable, when mingled with hay; a very small portion will then poison and kill them. This noxious plant is very common in wet meadows; it is dangerous, and occupies the place of a great many others that would be profitable. In order to destroy it, dig out the bulbs or onions, and thereby prevent the seeds from disseminating themselves over the whole meadow. The bulbs, being sunk about eight inches into the ground, would cause their extraction to be difficult, but the produce of an abundant and better vegetation will shortly compensate trouble and expenses.

"Together with this plant, rushes, ranunculacea, sorrel, etc., are certain indications of the utility of drainage; they are fond of moisture; it is, therefore, obvious that drainage will cause them to languish and to die, to be soon replaced by species of better quality. It is only by thorough ditching, or rather by underdrainage—the effects of which are still more efficient—that one will succed in obtaining so fortunate a transformation."

We neglected to state in the proper place that all lands whose indigenous growth of timber was beech, maple, ash, elm, or any other kinds of timber or shrubs requiring wet soil, is seldom tillable, and never profitably so, until it is underdrained.

Some years since, Congress proposed to donate to each State the amount of swamp lands which they respectively contained. In Ohio every county was authorized to commission a surveyor, or other competent person, to ascertain the number of acres of swamp land in each county, and report to the Auditor of State. Not more than five or six counties availed themselves of this opportunity to bring the remnants of public lands into market, and the total number of acres reported amounted to 28,000 only. Governor S. P. Chase expressed the opinion that Ohio was entitled to the entire amount of public lands within her territory as swamp lands—at that time about 250,000 acres. But even this amount is less than the actual amount of swamp lands in the State.

It is almost unnecessary to state that open ditches are not required on underdrained grounds, except as main drains, leading to a creek or river; neither is the furrow necessary between lands for the purpose of surface drainage. By discarding the furrows, considerable area for the growth of plants is added to the field; and in this particular, by increasing the superficial area, drainage is a two-fold benefit.

We observed, while traveling on the cars over the Dayton & Michigan Railroad, throughout the "Black Swamp" region, through which this road passes, that ditches were made in removing the earth in constructing the road, which answered an admirable purpose for draining. In consequence of these ditches, the timber, being of that class which flourishes best in a moist or wet soil, for several rods on each side of the road, was either dead or dying—the ditches evidently drained to the extent of several rods in every direction, and the trees, finding themselves deprived of their accustomed supply of moisture, could no longer vegetate or exist. Not only were the trees dying, but the succulent plants, which require a wet soil, had released their claim, in consequence of man's improvement, and yielded their place to plants requiring less moisture. Hence, the cheapest and most effectual method of ridding meadows of "sour grasses" *(carices)* is to underdrain.

Annexed is a list of plants whose presence is always an unmistakable evidence of the necessity of drainage—because they flourish only in very moist or wet soil. At the same time we are well aware that every practical farmer understands the condition of his soil better, perhaps, than he does botany; but there are others who may wish to engage in agricultural operations who understand botany better than they do the character or condition of soils. In the "*Wheat Plant*" we devoted a chapter to an examination of the characteristics and qualities of soil, as indicated by the indigenous forest trees which it produced, and the following list is a further demonstration of the same idea. As soon as the soil is properly underdrained, all the plants named in the list will disappear, because their accustomed supply of moisture will then be withdrawn, and they, of course, will perish:

Botanical Name.	Common Name.
Ranunculus alismaefolius,	Water Plantain, Spearwort.
“ sceleratus,	Cursed crowfoot.
“ Pennsylvanicus,	Bristly crowfoot.
Caltha palustris,	Marsh marigold.
Nasturtium officinale,	Water cress.
“ palustre,	Marsh cress.
Cardamine pratensis,	Cuckoo flower.
Impatiens pallida,	Pale touch-me-not.
“ fulva,	Spotted touch-me-not.
Flœrkea proserpinacoides,	False mermaid.
Rhus venenata,	Poison sumach, Dogwood.
Sanguisorba Canadensis,	Canadian burnet.
Geum strictum,	Avens.
“ rivale,	Water, or purple avens.
Rosa Carolina,	Swamp rose.
Rhexia Virginica,	Deer grass.
Lythrum alatum,	Loosestrife.
Nesaea verticillata,	
Epilobium coloratum,	Willow herb.
Ludwigia palustris,	Water purslane.
Penthorum sedoides,	Ditch stone crop.
Saxifraga Pennsylvanica,	Swamp saxifrage.
Heracleum lanatum,	Cow parsnip.
Archemora regida,	Cow bane.
Cicuta maculata,	Water Hemlock.
“ bulbifera,	Hemlock.
Conium maculatum,	Poison hemlock.
Cornus sericea,	Silky cornel.
“ stolonifera,	Red osier dogwood
“ stricta,	Stiff cornel.
Cephalanthus occidentalis,	Button bush.
Solidago Ohioensis,	Golden rod
“ Riddellii,	
“ patula,	
“ lanceolata,	

Botanical name.	Common name.
Helianthus giganteus,	Sunflower.
Coreopsis trichosperma,	Tick seed sunflower.
Bidens cernua,	Burr marigold.
" chrysanthemoides,	"
Helenium autumnale,	Sneezeweed.
Cacalia tuberosa,	Tuberous Indian plantain.
Cirsium muticum,	Swamp thistle.
Lobelia cardinalis,	Cardinal flower.
" syphilitica,	Great lobelia.
" Kalmii,	
Plantago major,	Rib grass.
Lysimachia ciliata,	Loosestrife.
" radicans,	"
" lanceolata,	"
Chelone glabra,	Snakehead.
Mimulus ringens,	Monkey flower.
" alatus,	
Veronica anagallis,	Water speedwell.
" Americana,	Brooklime.
" scutellata,	Marsh speedwell.
Gerardia purpurea,	
Pedicularis Canadensis,	Lousewort.
" lanceolata,	
Dianthera Americana,	Water willow.
Lippia lanceolata,	Fog fruit.
Physostegia Virginiana,	False dragon head.
Scutellaria lateriflora,	Skullcap.
Myosotis palustris,	Forget-me-not.
Asclepias incarnata,	
Polygonum amphibium,	Knotweed.
" Pennsylvanicum,	
" hydropiper,	
" acre,	
" hydropiperoides,	
Rumex verticillatus,	Swamp dock.
" conglomeratus,	Green dock.
Quercus aquatica,	Swamp oak.
" palustris,	Water oak.
Symplocarpus fœtidus,	Skunk cabbage.
Acorus calamus,	Sweet flag, Calamus.
Typha latifolia,	Cat-tail flag.
Triglochin palustre,	Arrow grass.
Alisma plantago,	Water plantain.
Sagittaria variabilis,	Arrow head.
Platanthera peramœna,	Great purple orchis.
Spiranthes latifolia,	Ladies' tresses.
Cypripedium spectabile,	Ladies' slipper.
Iris Virginica,	Blue flag.
Sisyrinchium Bermudiana,	Blue-eyed grass.
Scilla Fraserii,	Squill, White hyacinth.
Lilium Canadense,	Wild yellow lily.

Botanical name.	Common name.
Melanthium Virginicum	
Veratrum viride,	False hellebore.
Juncus effusus,	Bog rush.
" scirpoides,	
" militaris,	
" tenuis,	
Cyperus diandrus,	Galingale.
" strigosus,	
Eleocharis obtusa,	Spike rush
" palustris,	
" tenuis,	
" compressa,	
Scirpus sylvaticus,	Club rush.
" lineatus,	
" eriophorum,	Wool grass.
Eriophorum polystachyon,	Cotton grass.
Almost all Sedges,	
Leersia oryzoides,	White grass
Leersia Virginica,	
Alopecurus aristulatus,	Wild water-foxtail.
Cinna arundinacea,	Wood-reed grass.
Calamagrostis Canadensis,	Blue-joint grass.
Spartina cynosuroides,	Freshwater cord grass.
Glyceria elongata,	Manna grass.
" nervata,	
" fluitans,	
Phragmites communis,	Reed.
Holcus lanatus,	Meadow soft grass.
Hierochloa borealis,	Vanilla.
Phalaris arundinacea,	Reed canary grass.
Milium effusum,	Millett grass.
Sorghum nutans,	Indian grass.

CHAPTER XVIII.

ON THE ABSORBING QUALITIES OF SOIL AND ANALYSIS OF DRAIN WATER.

It has been urged in some very intelligent circles that drainage would, in course of time, impoverish the soil drained, by the drain water carrying off nutritive substances held in solution. At first view this hypothesis, startling as it was, appeared *rational*, to say the least. Way, Leibig, and other eminent and celebrated chemists, determined to ascertain what proportion, as well as what kinds of nutritive elements were borne away by drainage water, when, to their astonishment, they found that the soils at once fixed, and held all the elements necessary for the growth and maturity of the plant, and that the amount escaping by the drains was in an infinitesimal degree only.

Believing that the views and experiments of these chemists on this subject are eminently proper in this place, we here give them in detail:

In 1850, J. Thomas Way published in the *Journal of the Royal Agricultural Society of England*,* an essay "On the Power of Soils to Absorb Manure," detailing a series of most remarkable experiments, which will prove of great importance in modifying the theory, and in confirming or disproving the practice of many agricultural operations. These experiments prove that certain manuring ingredients, when brought (in soluble condition) in contact with soil, lose their soluble form, and combine in a peculiar manner with the soil.

Way's experiments were induced by observations made by H. S. Thompson and Huxtable, who had found that liquid manure, when brought in contact with loamy soil, loses its color and odor; and, according to the statement of H. S. Thompson, soils have the faculty of separating ammonia from its combination by withdrawing it from water.

Way proved that the soil affects caustic, carbonate, sulphate, nitrate, and chlorate of ammonia in this manner; the ammonia is arrested, while the acids remain in the solution. He extended his experiments to the salts of potash, natron, lime and magnesia. He found, moreover, that if a solution of phosphate of natron or of guano, in diluted sulphuric acid (containing phosphoric acid and phosphate of lime), is filtered through soil, the phosphoric acid likewise disappears from the solution, and is arrested by the soil. He finally determined the quantities of ammonia and potash, absorbed and retained in this manner, by given weights of various soils.

He likewise showed that when putrid urine, water from the London sewers, and flax water, filtered through white clay, and a soil rich in clay (on Pusey's estate), the putrid urine loses its odor and all ammonia; and that the rest lose all their potash and phosphoric acid.

One of the important conclusions for practical agriculture deduced by Way from these experiments, was that the soluble ingredients of manure —in whatever form and dilution they are conveyed to the soil—are retained by the soil for the use of the plants. An English acre of soil (of the quality he used for his experiments) ten inches in depth, weight about 1,000 tuns, would absorb three tuns of ammonia. From this he infers: When the combination has once taken place, there appears to be no power in water to distribute this manure in the soil. It follows that if in the application of manure we are not careful to make an equal distribution, we compel the roots of the plants to seek their food at a distance.

The experiments of Way were mostly made in clay soil—white clay and pipe clay; and the comparison of their absorbing qualities with those of sand induced him to ascribe the absorbing power of soil to the clay (silicate of alumina). He afterwards endeavored to confirm this view, by the discovery of the effects of silicate of clay and lime, artificially produced. This latter view, according to which the absorbing qualities of soil were to be ascribed to a cause purely chemical, cannot claim general assent. The pure hydrate of clay soil possesses the power of absorbing potash and ammonia in a higher degree than the soils. But the facts discovered by him are entirely independent of his explanation of them. And if it can be proved, that the absorbing power of the soil belongs to the ground, or arable soil in general—whatever be its composition—these facts will establish a new view on the nutrition of plants, and on the manner in which they receive their non-gaseous substances from the soil.

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* Vol. XI, page 313.

Mr. Way's observations and conclusions refer to certain soluble salts and ingredients of manure only. But as the manure applied to the fields in practical agriculture, does not cause the fertility of soil, but merely contributes to its preservation, it is obvious that the nutrition of plants, existing in the soil and identical with the ingredients of manure, must operate in a manner similar to the latter. And if the soluble manurial elements applied to the field are separated from the solution, as soon as they come in contact with the soil, and form an insoluble combination with the soil, we must infer that the nutritious substances identical with those elements and existing in the soil, can likewise not be conveyed to the plants in a solution, but that the roots of plants appropriate these substances in a manner as yet not ascertained.

The roots of plants receive—according to the views of vegetable physiologists and chemist—the elements for their nutrition from a solution. Rain water, of itself, or aided by carbonic acid, dissolves silicic acid, potash, lime, magnesia, phosphate of lime, phosphate of magnesia, and oxyd of iron. This solution spreads in the ground, and is absorbed by the roots of the plants. The plant acts like a sponge, one-half of which is in the air and the other in the soil. The water contained in it evaporates through the agency of leaves, while the roots re-absorb the water thus expelled. The quantity of mineral elements conveyed to the roots depends upon the quantity of fluid absorbed and evaporated, and the substances contained in solution in it.

This view evidently must be abandoned, if it can be proved that rain water of itself, or combined with carbonic acid, does not dissolve the mineral elements serving for the nutrition of plants in so perceptible a quantity, that a certain proportion of vegetation can be ascribed to the quantity conveyed in such a solution. Their absorption must, in this case, be ascribed to an active cause co-operating in the roots of the plants, imparting to the water surrounding the roots the power of dissolving certain mineral elements, which by itself it does not dissolve. We must furthermore infer that the quantity of absorbed mineral elements must be in proportion to the root-surface of the plants, and the aggregate of efficient mineral elements contained in those parts of the earth which are in contact with the root-surface.

In order to obtain more definite results regarding these questions, experiments have been made* to determine the relations of salts of potash, silicate of potash, and solutions of earthy phosphates, to a large number of earths of various regions and different composition, among which there were clayey soils from Hungary, six limy soils from Havana, limy loam soil from Weilhenstephan and Bogenhausen, near Munich, three varieties of lime soil from the neighborhood of Munich of Schleissheim. Particular care had been taken to select such soils as were influenced by salts of ammonia, in exactly the same manner as those which Way used in his experiments.

A syphon having the capacity of 300 cubic centimetres of water, was filled with this earth, and a double volume of the solution of salts of potash was filtered through. The contents of the solution in the salts of potash were known, those of the filtrate were quantitatively determined.

Experiments with Sulphate of Potash.—The solution contained in each cubic centimetre: 1 mgrm. of salt. 260 centimetres of the liquid were filtered through loam soil from Bogenhausen, evaporated to dryness, and treated with chloride of platinum, they yielded: 0·0325 of chloride of platinum and potassium, which corresponds to 6·2 mgrms. of potash; 518 mgrms. of potash had consequently been absorbed from 1000 CC. [cubic centimetres] of the solution, or 541 mgrms. of potash.

Soil from Hungary (clay soil) treated with the same solution, yielded a filtrate, 420 of which contained 4.6 mgrms. of potash; 535·4 mgrms. of potash had consequently been absorbed from 1000 CC. of the solution.

Garden mold (rich in lime) yielded a filtrate, 1000 CC. of which retained but 16 mgrms. of solved potash.

It scarcely needs to be mentioned that when filtrates still containing perceptible quantities of potash were again brought in contact with earth, they lost it all.

The same quantity of earth absorbed potash from a diluted solution of nitrate and chloride of potash to such an extent that the quantity remaining in the liquid after filtration could not be quantitatively determined.

The experiments with chloride of potash proved also that the soil's power of absorbing was limited to potash, excluding the chloride.

Soils are not indifferent to salts of natron; but their power of absorbing natron from its combination in solution is much less when compared with the power with which they retain potash.

300 CC. of Bogenhausen lime soil were treated in the manner described, with a solution of nitrate of natron (2000 mgrms. in one litre of water),

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* By Prof. Leibig.

and the 220 CC. of the filtrate, yielded 204 mgrms. of nitrate of natron; the earth had consequently retained but 54 per cent. of the natron in solution. The same quantity of the same earth was treated with an equally strong solution of nitrate of potash (2 grms. per litre) and left no definable quantity of potash in 220 CC. of the filtrate.

A solution of sulphate of natron (2 grms. per litre) filtered through the same soil retained, in 220 CC. of filtrate, 237 mgrms. of sulphate of natron.

The effect of common salt upon soil is like that of chloride of potash; the entire amount of chloride in the liquid is found again in the filtrate, a certain quantity of the base of natron is retained, and we find in its stead in the filtrate a corresponding quantity of lime and magnesia.

Loamy soil, yielding only a trace of lime to pure water, was brought in contact with a solution of common salt, containing three grms. of salt in one litre; its filtrate showed a very considerable amount of lime and a total absence of sulphuric acid.

Specimens of soil were finally treated with a mixture of liquid manure and water, containing, beside, carbonate of ammonia, salts of potash and natron. The amount of the last two had previously been fixed by the analysis of liquid manure: it contained in 125 CC. 86·7 milligrams of potash and 16·8 mgrms. of natron. The liquid manure was filtered through 300 CC. of earth, and 125 CC. were employed for a new analysis. The potash was, in this filtrate, diminished to 5·6 mgrms; of the 16.8 mgrms. of natron, 5 only had been absorbed. The carbonate of ammonia of the liquid manure had been completely arrested by the earth, so that it could not be traced in the filtrate.

These, and a long series of similar experiments with most various soils, prove that the relation of soil to salts of potash (discovered by Way) is altogether a general quality of arable soil. The inferences with regard to the soluble ingredients of *manure* are thus completely confirmed. The facts ascertained by Way establish, therefore, the law, that the plants do not absorb the manurial substances applied to fields in a soluble state directly, and in the form in which they are contained in manure, but that they previously combine with certain ingredients of the soil, whereby they lose their solubility in the water.

Meadow and wild plants receive manure. Although it seems probable that they, too, do not receive their incombustible substances from a solution of the same, but that their roots must, like those of the cultivated plants, absorb their nutritious elements directly from the soil. The experiments of Way, with respect to the manner of nutrition of plants, do not warrant a general application of his inferences. As to water plants floating on the water's surface, the roots of which do not reach the ground, their mineral ingredients must necessarily have been conveyed in a solution.

J. v. Liebig has made some experiments respecting these questions, and from them he is led to believe that the manner in which the land and water plants receive their nutritive elements may be demonstrated.

The uncultivated plants receive the alkalies of their ashes from the silicates, and the phosphoric acid from phosphate of lime, or phosphate of magnesia.

The relation of silicates of alkalies and of a solution of the above-named phosphates of alkalies in carburetted water to the different soils was examined, and it was found that silicate of potash operates precisely like all salts of potash. The determination of the quantity of potash absorbed by the soils is, by the use of this salt, far easier and less laborious than with the other salts of potash, since it has a strong alkaline reaction, and the decrease of potash in its solution can safely be observed with a good re-agent (paper).

If a diluted solution of silicate potash be brought in contact with soil, it instantly loses its alkaline reaction. The quantity of alkali absorbed by a given weight or volume of earth may thus be readily ascertained. The soils for these experiments were measured in uniform powder by means of a vessel divided into cubic centimetres and brought into a glass bottle; portions of the solution of silicate of alkali were then added, and they were shaken till the fluid manifested a feeble alkaline reaction.

The solution of the silicate contained, according to a previous analysis, in 1000 CC. 1·166 grains of potash free from water, and 2·78 of silicic acid.

SOILS FROM THE NEIGHBORHOOD OF MUNICH.

I. 400 CC. of garden mold (containing 31·8 per cent. of carbonate of lime) neutralized the alkaline reaction of 810 CC. of the above-named solution of silicate of potash; 1000 CC. of earth absorbed consequently 2·344 grms. of potash.

II. 1000 CC. of the same earth mixed with another solution of silicate of potash, containing 1·183 of potash in 1000 CC., absorbed the potash of 1940 CC. of this solution=2·294 grms. of potash.

III. 1000 CC. of soil (loam) absorbed the potash from 2200 CC. of the same solution=2·601 grms. of potash.

IV. 1000 CC. of soil (loam) absorbed the potash from 2·000 CC. of the same solution=2·366 grms. of potash.

V. 1000 CC. of loam (3·77 per c. of lime) absorbed the potash from 1906 CC. of solution=2·206 grms. of potash.

CLAY SOIL FROM HUNGARY.

This soil is of a brownish gray color, and possesses a quality rarely noticed in other soils in Germany. This earth, with water, forms a plastic mass; when rubbed between the fingers it is imperceptibly fine; when decanted off, no sand remains, at least only a few grains, which are partly dissolved, effervescing with acids. The kneaded mass does not, when dried, fall to pieces, and yields, when burnt, a pale ochry-yellow, inwardly black, porous mass, melting in stronger fire. There were three specimens of earth:

I. Cucuritza Batrin. II. *Alba dolina;* and III. Funtmular. 1000 CC. of these earths weighed, on an average, 1232 grammes. They stood in the following relations to a solution of silicate of potash, 1·183 mgrms. of potash in 1 litre:

1000 CC. of Hungarian soil, I., absorbed the potash of 2855 CC. of solution=3·377 grms. of potash.

1000 CC. of Hungarian soil, II., absorbed the potash of 2785 CC. of solution=3·294 grms. of potash.

1000 CC. of Hungarian soil, III., absorbed the potash of 2685 CC. of solution=3·177 grms. of potash.

HAVANA SOILS.

No. I, of gray color; 1000 CC. of earth absorbed the potash from 1526 CC. of solution=1·805 grms. of potash.

No. II, of yellow color; 1000 CC. of earth absorbed the potash from 1058 CC. of solution=1·251 grms. of potash.

No. III, of red color; 1000 CC. of earth absorbed the potash from 1916 CC. of solution=2·266 grms. of potash.

No. IV, of red color; 1000 CC. of earth absorbed the potash from 1769 CC. of solution=2·092 grms. of potash.

No. V, of gray color; 1000 CC. of earth absorbed the potash from 1210 CC. of solution=1·431 grms. of potash.

No. VI, of gray color; 1000 CC. of earth absorbed the potash from 1150 CC. of solution=1·360 grms. of potash.

The nature and quality of these earths prove that their power of absorbing potash does not belong to a certain composition, and that this quality is chemical, and depends upon a certain mechanical quality or porosity.

The chemical relations are obvious in the relation of the salts of potash to soils, and of their conversion into combinations of lime and magnesia. The soils do not absorb the salts, but potash or the base; and the absorption of alkali would not be likely to occur if the acid did not come in contact with a body representing potash and neutralizing the acid.

If the affinity of soil for potash were chemical, the former would depend upon a chemical combination existing in the soil, and the quantity of alkali absorbed would be in proportion to the quantity of this combination.

All the earths examined were mixtures of clay and lime, and contained a certain amount of sand in mechanical admixture.

If the absorbing quality depended upon the silicate of clay, it would increase with the quantity of lime, or decrease with that of clay. But there is, in this respect, hardly any difference in the earths examined, with exception of the Hungarian, as will be seen in the following synopsis:

1000 cubic centimetres of soil from	Bogenhausen,	Garden mold,	Havana, No. III.
Contain	6·6 per cent.	32·2 per cent.	57 per cent. of carbon. of lime.
Absorbed	2366 mgrms.	2344 mgrms.	2266 mgrms. of potash.

These experiments exhibit no special relation of the absorbing power to the clayey contents of these earths. The Bogenhausen loam is so rich in clay that it is used for manufacturing tiles. The Havana earth, No. III, is a dry, poor lime soil, of a red color, due to its oxyd of iron. Both differ exceedingly in their composition, and have, notwithstanding, the same power of absorbing potash.

As to carbonate of lime, we know that a piece of chalk or a porous limestone, placed in a diluted solution of potash "*water-glass*," becomes a stony mass, almost bearing a polish, and but slightly porous; that carbonate of lime—as Fuchs discovered—is not decomposed, but combines with a certain quantity of the silicate of potash contained in the fluid. If we pulverize chalk very finely, wash it, and bring it in contact with silicate of potash, this latter substance is very sparingly absorbed by the fluid. 10 CC. of the solution of silicate of potash, containing 11·8 mgrms. of alkali, were mixed with chalk, and its alkaline reaction was not perceptible until 115 CC. of powdered chalk had been added; the reaction was caused by the addition of water and the subsequent dilution of the alkaline solution, rather than by the absorption of alkali. This filtered liquid was concentrated by evaporation, and reassumed the alkaline reaction that had become imperceptible, in consequence of dilution.

Pure hydrate of clay soil was found to separate the greatest amount of silicate of potash from its solutions, so that the latter lose their alkaline reaction.

In one experiment, a quantity of hydrate of clay soil, corresponding= 2·696 grms. of burnt clay soil, absorbed silicate of potash from 150 CC. of a solution, containing in 1000 CC. 1.185 grms. of potash and 3·000 grms. of silicic acid. If we suppose that one kilogramme of clay soil occupies, as a dry hydrate, the space of one cubic decimetre, so that it is as heavy as one litre of soil, one litre of this hydrate of clay soil would have absorbed the potash and silicic acid from 4600 CC. of this solution, *i. e.*, 26 grms. of potash. This is about seven times as much as the Hungarian earth No. I may absorb from the same solution. We must, therefore, presume that hydrate of clay, in admixture with silicates of clay, partakes also of the soil's power of absorbing silicate of alkali. We can readily perceive that this quality is very complicated.

The soil is not influenced by silicic acid combined in solution with alkali in the same manner as by an alkali alone.

A solution of the silicate of potash, filtered through forest soil, yielded a brown-colored filtrate of a feeble acid reaction, in which the potash and silicic acid were fixed.

Garden mold, loam soil, and Hungarian earth were treated in the same manner, and 250 to 500 CC. of the filtrate (which did not react) were employed to determine the silicic acid and potash contained in it. The following are the results obtained:

1000 CC. of a solution of potash, "*water-glass*," filtered through forest soil, retained in solution 215 mgrms. of potash and 2765 mgrms, of silicic acid.

1000 CC. of the same solution, filtered through garden mold, retained in solution 111 mgrms. of potash and 1699 mgrms. of silicic acid.

1000 CC. of the same solution, filtered through loam soil (Bogenhausen), retained in solution 18 mgrms. of potash and 773 mgrms. of silicic acid.

1000 CC. of the same solution, filtered through garden mold, retained in solution 18 mgrms. of potash and 353 mgrms. of silicic acid.

1000 CC. of the same solution, filtered through Hungarian soil II, retained in solution 14 mgrms. of potash and 136 mgrms. of silicic acid.

The applied ("water-glass") solution contained per litre, 1166 mgrms. of potash and 2780 mgrms. of silicic acid; there remained, after filtering through forest earth, 215 mgrms. of potash and 2965 mgrms. of silicic acid; the forest earth had consequently absorbed 957 mgrms. of potash and 15 mgrms. of silicic acid.

The garden mold I absorbed in a similar manner from the fluid, 1055 mgrms. of potash and 1081 mgrms. of silicic acid.

Bogenhausen loam soil absorbed in a similar manner from the fluid, 1148 mgrms. of potash and 2007 mgrms. of silicic acid.

Garden soil II absorbed in a similar manner from the fluid (amount potash not defined), 2425 mgrms. of silicic acid.

Hungarian soil II absorbed in a similar manner from the fluid, 1142 mgrms. of potash and 2611 mgrms. of silicic acid.

The forest earth and Hungarian soil represent, in these experiments, the utmost limits of affinity for absorbing silicic acid. The former had absorbed, from the solution of the silicate of potash, three-fourths of the potash and almost no silicic acid; while the latter had pretty much absorbed all the potash and silicic acid in solution.

The liquids filtered through forest, garden and loam soil were so rich in silicic acid that they gelatinized, when evaporated, like the solution of a silicate in an acid. The forest soil, having absorbed the smallest quantity of silicic acid, yielded, in the beginning, a light brown-colored filtrate of feeble acid reaction. The filtrates of garden soil I and of the loam soil were likewise dark colored, and the slight power of absorbing silicic acid may be explained as having its cause in the organic matter or the decaying vegetable substances, as they contained these earths in larger quantities than the others, which had absorbed more silicic acid from the same solution.

The following experiments will, perhaps, confirm this conclusion. The earths examined were dried at a high temperature, and exposed to a red heat in the air. The forest soil lost in combustible substances 30·9 per cent.; the garden soil I, 18 per cent.; the loam soil, 8·7; the Hungarian soil, 9·84; the Havana soil III contained 5·5 per cent. only, the least quantity of organic substances.

Equally large volumes of the last two earths were mixed with the same solution ("water-glass") until the fluids showed a very feeble but perfectly uniform alkaline reaction; they were then filtered, and the silicic acid of the fluid was determined. In these experiments, the earths came in contact with a very insignificant excess of the solution of silicic potash.

1000 CC. of the filtrate of the Hungarian soil retained in solution 1010 mgrms. of silicic acid; the filtrate of the Havana soil contained in the same volume 580 mgrms. of silicic acid. The organic substances existing in the soil—humus—possess the character of an acid, or the quality of combining with alkaline bases, in a higher degree than the silicic acid, and seem to a certain extent to neutralize this power of entering into insoluble combinations with the silicates of lime and clay soil. The chemical nature of the soil has, however, a great influence in this particular.

Thus, the two garden soils stood in varying relations to the silicic acid of the silicate of potash, although they contained very near the same amount of combustible substances. A certain quantity of earth absorbs 1081 mgrms. of a solution of silicate of potash, while another equally large quantity of soil had absorbed 2425 mgrms. of silicic acid; the latter soil contained a considerable amount of carbonate of lime, while the former contained a large portion of silicious sand. The filtrates of both were perfectly neutral, but differed widely in their coloring. The percolated liquid (of the solution of silicate of potash) of the garden soil, rich in lime, was very slightly brown; that of the soil rich in sand and destitute of lime was of a deep brown color.

The forest soil, which absorbed scarcely any silicic acid, yielded, when calcined, a residuum which did not effervesce with acids, and consisted for the greater part of silicious sand. This soil was mixed with about 10 per cent. of washed chalk, dried, and afterward a solution of silicate of potash was filtered through it. The filtrate was neutral and much less colored than it was before (without the chalk). 95 CC. of filtrate yielded 199 mgrms. of silicic acid; 100 CC. 21 mgrms. of potash; 1000 CC. gave, therefore, 2090 mgrms. of silicic acid and 210 mgrms. of potash. The solution (of "water-glass") contained, before its contact with the soil, per litre: 1277 mgrms. of potash and 3230 mgrms. of silicic acid. The same earth which previously absorbed 15 mgrms. only of silicic acid, and 951 mgrms. of potash—with a large amount of organic substances and a lack of alkaline bases—from one litre of solution (of "water-glass"), containing 1167 mgrms. of potash and 2765 mgrms. of silicic acid—the same earth now absorbed, from the same volume of solution, 1140 mgrms. of silicic acid and 1060 mgrms. of potash. Washed chalk absorbs by itself, under these circumstances, no definable quantity of alkali and silicic acid.

The same forest soil was finally incorporated with lime water into a paste, to which a sufficient quantity of lime water was added from time to time, until it exhibited a feeble alkaline reaction; the latter was neutralized y a supply of earth. This earth had thus lost its acid reaction without the presence of an excess of lime; it was subsequently dried, and combined with a solution of silicate of potash. The filtrate exhibited a feeble alkaline reaction of lime; but the silicic acid had decreased from 3230 mgrms. per litre to 61 mgrms., and the potash from 1277 to 290 mgrms., which had remained in the solution.

Soils, by burning, undergo a remarkable modification in their power of absorbing silicic acid. Loam soil (Bogenhausen) was burnt in the air (in order to destroy the organic substance), and combined with the solution of potash (water-glass).

No diminution of alkaline reaction had taken place in the filtrate; but the silicic acid had been completely separated from the solution. 20 CC. of the filtrate required 24 CC. of a solution of oxalic acid to neutralize it. There existed more alkali in the filtrate than in the liquid employed, and a close investigation proved that a certain quantity of caustic lime had been dissolved.

It results from these experiments that vegetable remains in the soil exert an influence on the distribution of the hydrate of silica to the roots. This may, perhaps, explain the influence of a certain amount of humus in the soil—or of the organic remains of plants with widely-spread roots, as clover—upon the growth of the subsequent plants; as well as the occurrence of plants abounding in silicic acid in stagnant waters and swamps, upon the soil of which great quantities of decaying vegetable matter are accumulating.

These facts warrant the conclusion that potash is afforded to the plants in one relation only, or that they separate it from one combination only.

Chloride of potassium and sulphate or nitrate of potash do not operate in the soil in the form in which they are applied; but the base separated from the acid, the latter forming, with lime and magnesia, salts of another chemical nature.

The plant does not absorb those substances in consequence of a decomposing process in its organism after their reception. The soil accomplishes this decomposition previous to absorption, inasmuch as it separates the potash from the acid with which it was combined, and renders it insoluble in water.

Any soil possesses a certain power of absorbing potash; this power can be represented by a figure; and it is not unlikely that the quality of soil may be determined by this illustration.

Ammonia, either pure, or in the form of salts, acts precisely like potash.

A manufacturer on the Rhine, being desirous of extracting oxide of copper from bituminous marl-slate, in which it existed in the form of malachite and lapis lazuli, hit upon the idea of using ammonia for this purpose, as it had, in experiments on a smaller scale, furnished satisfactory results. He constructed, at considerable expense, an extracting apparatus on a large scale, consisting of two basins, connected with each other by a very wide pipe. One of them was used for the ammoniacal liquid; the pipe was filled with bituminous marl-slate; the second basin served as a condenser. Ammonia and water vapor were, according to this arrangement, to be driven with the copper ore through the pipe, to condense there and to dissolve the oxide of copper; the solution was to flow into the second basin. The pipe was afterward to be filled again with copper ore, and the ammonia of the satiated solution was to be driven out by boiling, and to serve again to extract another portion of the copper ore. As the apparatus was hermetically closed, it was hoped that the same ammonia could be employed without loss to extract large quantities of copper ore. One of the two basins served alternately as condenser. The first experiment was satisfactory, inasmuch as a solution of oxide of copper was collected in one of the basins; but when the ammonia was driven through another portion of bituminous marl-slate, it disappeared in an unaccountable manner to the manufacturer, so that the proceeding was ultimately abandoned. The disappearance of ammonia in these operations had been undoubtedly caused by being absorbed by the bituminous marl-slate. This fact may be regarded as a proof of the powerful affinity between them, which does not appear to be neutralized even by the influence of a high temperature.

The power of certain soils to absorb ammonia may be sufficient, perhaps, to separate—in manufacturing artificial manure—ammonia from very diluted ammoniacal liquids, putrid urine and other liquids, and to combine them instead of an acid.

Urine substances, which in putrid state are converted into carbonate ammonia, are not separated from their solutions by the soil. A solution of urine (2000 mgrms. per litre), before or after filtration through soil, required an equally large portion of nitrous oxide of mercury to precipitate it, so that not the smallest portion of it seemed to have been absorbed by the soil.

The relation of a solution of phosphate of lime, phosphate of magnesia, or phosphate of ammoniated magnesia to soil, is similar to that of a solution of salts of potash or ammonia. This seems to prove that the effect produced by soil upon these solutions, is based partially upon the formation of chemical combinations.

While in the salts of potash and ammonia only the alkali is extracted and retained by the soil, this affinity extends to the phosphates, and more especially to phosphoric acid.

Liebig mixed lime water with diluted phosphoric acid, so that neither alkaline nor acid reaction could be perceived. The precipitate thus produced was dissolved in water holding carbonic acid in excess. Similar solutions were subsequently made (by him) of phosphate of ammoniated magnesia in carburetted water.

Measured quantities of these solutions were then brought into contact with different soils until specimens of the filtered liquids gave manifest indications of the presence of phosphoric acid by a distinct reaction of molybdate. Thus, it was approximately ascertained that from the solution of phosphate of lime which contained 610 mgrms. of phosphate of lime per litre:

1000 CC.	of loam soil	absorbed	1098	mgrms.	of phosphate	of lime.
"	garden soil	"	976	"	"	"
"	soil of Weihenstephan,		976	"	"	"
"	" Schleissheim,		976	"	"	"

These experiments show that equal volumes of these may differ very little in their affinity for phosphoric acid.

The liquids filtered through these soils were almost as limy as before, and appeared to have lost the phosphoric acid only; but these soils contained a considerable quantity of carbonate of lime. While, therefore, the phosphate of lime contained in the soil was separated from its solution in carburetted water, the latter retained its power of dissolving the carbonate of lime. An acetate was formed from the carbonate of lime, which filtered through without being decomposed.

An addition of chalk decanted off will not cause phosphate of lime to be separated from a solution of phosphate of lime in carburetted water; the fluid retains its reaction on phosporic acid.

The relation of soils to phosphate of ammonia and phosphate of magnesia is similar to that of phosphate of lime. They exhibited in this salt, too, very slight difference in their power of absorption.

Equal volumes of Bogenhausen loam soil, garden soil, and soils from Weihenstephan and Schleissheim, absorbed the same quantity of phosphate of magnesia-ammonia—that is, they separated this salt from an equal volume of its solution in carburetted water. 1000 CC. of these soils required, in order to determine the presence of phosphoric acid in the filtrate, 1800 CC. of a solution containing 1425 mgrms. of salt of magnesia per litre. The phosphoric acid, magnesia and ammonia disappeared simultaneously from the solution, and the filtrate received an abundant quantity of lime in their place. The filtrate of the Schleissheim soil contained 884 mgrms. of lime in 1800 CC.; the filtrate of the garden soil, 524 mgrms.; that of the soil from Weihenstephan, 402 mgrms.; that of the loam soil from Bogenhausen, 456 mgrms. of lime. These quantities of lime are evidently in no relation to each other or to the salt previously dissolved.

The salt of magnesia is not precipitated from a solution of phosphate of magnesia and ammonia in carburetted water, when brought in contact with decanted chalk; lime does not supplant magnesia. From the relation of soil to lime, ammonia and phosphoric acid, we may infer that the majority of our cultivated plants do not receive their most important mineral substances from a solution. For if the potash and ammonia are so completely separated from the acids with which they are combined, and from water, that, after the percolation of their solutions through strata that are not deeper than tillable soil, chemical analysis can hardly discover any traces of these substances. It cannot be supposed that rain water in itself, or with the aid of a small per cent. of carbonic acid, should be able to separate these substances from the soil, and to form a solution capable of spreading in the soil without losing the substances held in solution. The same remark will apply to phosphoric acid and the phosphates generally. Water, holding carbonic acid in excess, will dissolve this salt wherever it meets in connection with phosphate of lime; but this means of solution can only cause the distribution of phosphates in the soil; the solution cannot leave the place where it was formed without its soluble salt being separated again from soil not saturated with it.

These substances exist in the soil in a condition ready to be absorbed by means of the roots; but they are not soluble in themselves by rain water, and cannot be separated by means of this solution till the soil holds it in excess.

The composition of our common river water, of springs and of drain water upon fields, serves to support these inferences.

A number of excellent analyses of river and spring water have been made by Graham, Miller and Hofmann, from which it appears that 10,000 gallons, or 500 tuns, of Thames water, taken from five different places of the Thames, contained:

Pounds.	Thames, Dillen.	Kew.	Barnes.	Redhouse, Battersea.	Lambeth.
Potash............	7.3	4.71	3.55	10.	7.3

The following spring waters contained in 100,000 gallons = 1,000,000 pounds:

Pounds.	Whitley.	Cutshmere.	Vellwood.	Hindhead.	Barford.	Cosfordhouse.
Potash.......	2.71	2.5	3.	0.7	1.8	6

Thomas Way found in drain water, *i. e.* in rain water filtrated through soil in a natural manner, the following ingredients in specimens of seven different fields:

	Grains in 1 Gallon = 70,000 Grains of Water.						
	1.	2.	3.	4.	5.	6.	7.
Potash......................	trace.	trace	0.02	0.05	trace.	0.22	trace.
Natron......................	1.00	2.17	2.26	0.87	1.42	1.40	3.20
Lime	4.85	7.19	6.05	2.26	2.52	5.82	13.00
Magnesia	0.68	2.32	2.48	0.41	0.21	0.93	2.50
Oxyd of iron and clay soil....	0.40	0.05	0.10	...	1.30	0.35	0.50
Silic acid	0.95	0.45	0.55	1.20	1.80	0.65	0.85
Chlorine	6.70	1.10	1.27	0.81	1.26	1.21	2.62
Sulphuric acid	1.65	5.15	4.40	1.71	1.29	3.12	9.51
Phosphoric acid	trace.	0.12	trace.	trace.	0.08	0.06	0.12
Ammonia	0.018	0.018	0.018	0.012	0.018	0.018	0.006

Dr. Krocker obtained quite similar results in his analysis of drain water at Proskau (Liebig and Kopp's Jahresb. f. 1853, 742):

	Drain Water (in 10,000 Parts).					
	a.	b.	c.	d.	e.	f.
Organic substance..................	0.25	0.24	0.16	0.06	0.63	0.56
Carbonate of lime..................	0.84	0.84	1.27	0.79	0.71	0.84
Sulphate of lime	2.08	2.10	1.14	0.17	0.77	0.72
Nitrate of lime..................	0.02	0.02	0.01	0.02	0.02	0.02
Carbonate of magnesia	0.70	0.69	0.47	0.27	0.27	0.16
Carbonate of iron	0.04	0.04	0.04	0.02	0.02	0.01
Potash	0.02	0.02	0.02	0.02	0.04	0.06
Natron..........................	0.11	0.15	0.13	0.10	0.05	0.04
Chloride of the base of natron (natrium)......................	0.08	0.06	0.07	0.03	0.01	0.01
Silicous earth	0.07	0.07	0.06	0.05	0.06	0.05
Total of solid substances.......	4.21	4.25	3.37	1.53	2.58	2.47

These drain waters contain all the substances which rain water can dissolve in the soil, and their composition gives an idea of the quantity which a plant can possibly obtain from this solution during its period of vegetation.

We will suppose that twelve millions of pounds of rain water fall upon an acre of ground during a year, and that the third part of this water has dissolved or holds in excess all the substances like the above-mentioned drain waters; that these four millions of pounds are completely absorbed in the months of June, July, August and September, by the roots of the potato plants cultivated in this soil, and are evaporated through their leaves. All the potato plants together would, in this case, not receive a single pound of this solution from the first four fields of an acre each; they would receive somewhat more than one pound from the two other fields (Nos. 5 and 6), and two pounds of potash from the seventh (No. 7).

Now an acre of ground produces an average crop of potatoes containing 408 pounds of ashes, in which there are 200 pounds of potash.

Supposing the fields—whose drain water was analyzed by Dr. Krocker—to be planted with beets, and that four millions of pounds of rain water, holding the mineral substances from the soil in excess, had been conveyed to the plant during the period of its vegetation; this rain water could have conveyed to the beet plants of the four fields of an acre each, only 8 pounds, of another 16 pounds, and of a third 24 pounds of potash.

The average crop of beets on an acre amounts, together with the leaves, to 100,000 pounds, containing 1,144 pounds of ashes, in which there are 495 pounds of potash!

The amount of ammonia in the drain water analyzed by Way is extraordinarily small. It can scarcely be imagined that one pound of ammonia dissolved in three and a half millions of pounds of water should exert any perceptible influence upon vegetation.

Its quantity could not be determined in a gallon (70,000 grains), of Thames water taken from four places to that amount, and there are in the water taken from the Thames near Redhouse, Battersea, 3 parts in 7 million parts of water. The Thames would, when used for irrigation, undoubtedly produce a considerable increase of the hay crop on many meadows; but, assuredly, not by the supply of ammonia, of which this water, as well as river and brook water in general, is so destitute.

The amount of phosphoric acid in the drain, river and common spring water is = nought. Krocker did not find any in drain water; Way found only traces of it in the water from three drains.

It appears from the relations of soil that the plant itself must be active in absorbing its nourishment; its existence as an organic being does not entirely depend upon exterior causes.

If the land plants received their nourishment from a solution, they could (according to time and proportion) absorb only as much as evaporates through their leaves; they could only absorb what the solution contains and conveys. It is certain that the water of the soil, and the evaporation by means of the leaves, co-operate in the process of assimilation as necessary agents of conveyance; but there exists in the soil a police protecting the plant from conveying injurious materials, and selecting only what the latter needs. Whatever the soil affords can be conveyed into its organism only by the co-operation of an active cause in the root.

The greatest number of cultivated plants are compelled to receive their mineral nutrition directly from the soil, so that their subsistence is endangered, and they are stunted and die away, if these substances are conveyed to them in a solution.

It is very difficult to imagine in what manner the plants bring about the solution of mineral ingredients. As a matter of course, water is indispensable for its transition.

There are frequently found in meadows smooth lime stones, the surface of which is covered with fine net-like furrows; if the stone is taken fresh from the ground, each deepened line or furrow is seen to correspond to some fiber, as if it had eaten its way into the stone.

The difficulty of explanation should not prevent us from investigating the facts in all directions, and to ascertain the full extent of their influence. There are always exceptions enough.

There must, of course, be other laws for the absorption of mineral nutrition by those water plants whose roots do not reach the ground. They must, like the sea plants, receive it from the surrounding medium; for wherever a plant is growing, it must find the conditions of its existence.

The examinations of waterworts (Lemna trisulea), gave rise to some interesting observations in this respect. This plant grows in stagnant waters, ponds and bogs, and floats on the surface of the water, so that its roots are in no connection whatever with the ground.

A number of these plants were collected (by Liebig), dried, burnt, and the ashes analyzed. Ten to fifteen litres of the swamp water from which they had been taken, and which was slightly green, were filtered and evaporated to dryness. The ashes and salt residuum of the water were subsequently subjected to an analysis.

The large quantity of mineral ingredients contained in this plant was really surprising; still more so was the quantity and quality of the elements of the swamp water, which indicated, by analysis, a very unexpected composition. We will put their analysis in juxtaposition, in order to facilitate comparison.

	Ashes of Waterworts. 100 parts of dried worts yielded 16.6 parts of ashes. There are in 100 parts of the burnt ashes:	Salt residuum 1 litre contains 0.415 grms. of residuum (slightly burnt). There are in 100 parts of salt:
Lime	16.82	35.00
Magnesia	5.08	12.264
Common salt	5.897	10.10
Chloride of potassium	1.45	....
Potash	13.16	3.97
Natron	....	0.471
Oxyd of iron, with traces of clay soil	7.36	0.721
Phosphoric acid	8.730	2.619
Sulphuric acid	6.09	8.271
Silicic acid	12.35	3.24

The comparison of the composition of water with the ingredients of ashes, shows that all the mineral substances of the former are to be found in the plant, with the exception of natron, but in a relation very much changed. The water contains 45 per cent. of lime and magnesia, the plant only 21 per cent. ; the water contains 0·72 per cent. of oxide of iron, the plant ten times more. The differences between phosphoric acid, potash, etc., are not less remarkable. A selection had obviously taken place: the plant absorbed the mineral substances in the proper proportions for its growth, and by no means in the relations offered by the fluid.

The great amount of mineral elements in the water is very remarkable; for it more than ten times exceeds that in drain water, and from twenty-five to thirty times that in spring water. This water represents, therefore, in its qualitative analysis, a mineral water nowhere else to be found.

The accession of the amount of potash, phosphoric acid, sulphuric acid, silicic acid and iron can be explained without difficulty. There are a vast number of decaying generations of plants gradually gathering in a swamp, the roots of which have taken up from the soil a great quantity of mineral substances. These remains of plants rot upon the bottom of the swamp ground, *i. e.*, they are burnt, and their inorganic elements (or their elements of ashes) are dissolved under the co-operation of carbonic acid, and, perhaps, of organic acids in the water; they remain dissolved when the surrounding mud and earth have been saturated with this solution.

It has been ascertained that this boggy water, when filtered through soil taken up about a foot from the margin of the water basin, does not lose its potash, while the potash of any other soil is rapidly separated from the same water.

Mud of ponds *(muck)*, stagnant waters and bogs, is often highly valued as an excellent means of improving the fields and increasing their fertility. This mud operates evidently like soil.

Water percolating through a soil in which remains of plants are accumulating and decaying, dissolves, of course, many mineral substances otherwise not found in those soils.

Verdeil and *Risler's* investigations as to the quantity of potash and phosphoric acid separated from soil by tepid water, are unfortunately not conclusive. They extracted about 40 pounds of soil by means of tepid distilled water, dried the clear yellowish extract, burnt it, and analysed the remains. They found, in the majority of cases, not more than 4, in others 6 to 8 and 9 per cent. of phosphate of lime. Another sediment contained 11, and another 18 per cent. of phosphate of lime. Chloride of potassium and natron amounted together from 3 to 9, in other cases to 14 and 18 per cent. The potash and natron of the silicates together in no case reached 8 per cent.

This investigation did not determine what per cent. of ashes was left by the extract, and how much of these substances had consequently been dissolved by the water. And this was evidently the principal point of this analysis. Had the watery extract of soil been 40 pounds with $\frac{1}{20}$ per cent. of ingredient of ashes, the mineral substances dissolved from the 40 pounds of earth would have amounted to 20 grms., and only 31 mgrms. of potash and 40 mgrms. of phosphate of lime would, according to the analysis, have been separated from 1000 grms. of soil. If the water extracted one fortieth of one per cent. of these substances, the analysis would, of course, indicate only one-half of the quantity of potash and phosphate of lime mentioned.

DRAIN WATER CONTAINS—ACCORDING TO KROCKER'S AND WAY'S ANALYSIS—$\frac{2}{10000}$ TO $\frac{4}{1000}$ OF DISSOLVED MINERAL SUBSTANCES.

The relation of arable soil to mineral nutritive substances, which exist in the soil or are conveyed to it in manure, result in some conclusions and applications of great importance to practical agriculture. The first inference is: that the quantity of ingredients absorbed in such cultivated plants as derive their nourishment directly from the soil, in a given time and under otherwise equal conditions, increases in proportion to the extent of the surface of roots, and that the fertility of soil is limited by its contents of nutritive matter in each part of the intersection of the soil downward as far as the roots reach. Liebig observes, in his *Chemical Letters:*

"The principal effect of manure on our fields seems to consist, in many cases, in the circumstance that the upper crust of the fields is more abundantly supplied with nourishment; the plants shoot out, therefore, during the period of their development, a tenfold, perhaps a hundred and a thousand-fold of (root) fibers; their subsequent growth is in proportion to this number of organs, by which they are enabled to find and to appropriate the less copious nutritious matter of deeper strata. This may be the reason why a comparatively small quantity of ammonia, alkalies and phosphates increases the fertility to such a high degree."

CULTURE OF THE APPLE AND PEAR.

BY F. R. ELLIOTT, CLEVELAND, O.

From the earliest periods of history, the apple has figured in poetry and prose as a fruit of wonderful virtues. Typical as the fruit of the tree of knowledge, partaking of which caused the expulsion of man from the garden of Eden: emblematical as the fruit possessed of power to confer immortality; reverenced by the ancient Druids, and connected by God and nature with the civilization and refinement of mankind, it has become in all temperate climates an indispensable requisite to health and longevity.

"The love, of fruits and flowers," says Wilder," is "natural and instructive, inbred in the soul of man. What an intimate communion exists between yourself and the tree which you train up in the way it should go." What sympathetic connection is produced by sight of the old apple tree of early life! It gave shade and fruit, comfort, health, and enjoyment to those who once moved in full vigor of life, and whose love cherished and instructed our dawning intellect. Little as we reverence the homes of our fathers, unbounded as is the ambition and energy of Americans as a people, the heart is yet within us, and the trees of our childhood, the apple especially, recall memories and associations that bring us nearer to the "homes of the blessed," and cause us more vividly to recognize the wisdom and benevolence of our Creator.

As a correct understanding of vegetable physiology, of the nature and growth of trees, is essential to enjoyment, in its true sense, of tree culture, and also to complete success in bringing about desired results, it is thought best, before entering upon the modes of cultivation and description of varieties, that short descriptions of the structure of the seed, root, stem, &c., be prepared; for no profession has so much to contend with, in a scientific point of view, as the grower of trees and fruits.

In all out-of-door operations the atmosphere is beyond control, and the operator must understand the wants and requisites, the nature and habit of his subject, in order to prepare his soil and culture to meet its demands. Our remarks will be made plain and with a view to instruct the novice, and not the professional horticulturist; and we shall endeavor to treat our subject and explain it as minutely, and as much in detail, as the limits of a condensed article will permit.

OF SEEDS.

The seed is a deposit of matter partaking of both root and stem, and undistinguishable components to produce at its proper period, fruit. By that systematic order, which vegetates all nature, the seed of the apple, pear, or grape, produces wood, root, and leaf unmistakable in appearance; but its *variety* is, when wrapped up within the corticle of the seed, impossible to be determined.

Seeds taken from a Baldwin apple may produce trees and fruit similar to the parent, or they may produce fruit entirely unlike it. This is caused by the mingling of fertilizing matter when the tree, which bore the seed, was in flower, and of which hereafter.

The *corticle* (a, Fig. 1) is the outer covering of the seed or embryo plant; the *germ*, b, is the point from which commences growth. In seeds that are perfect, this germ is always nearly white, but if the seed has been heated, or become exhausted by evaporation from age, the germ will exhibit a blackened or discolored appearance. As the germ commences to grow, it exhibits three parts: first (a, Fig. 2), the *radicle* or *root*, which descends; b, b, *cotyledons*, or rudiments of the first leaves that appear above ground; and c, the *plumule*, which forms the stem.

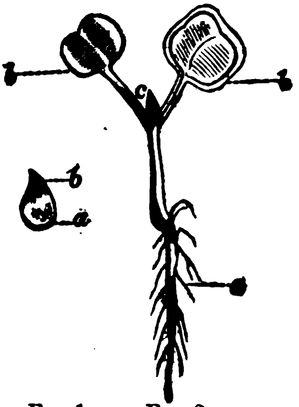


FIG. 1. FIG. 2.

Germination.—Air, heat, moisture, and exclusion of light are all requisite to healthy and certain germination or growth of seeds. These must be regulated by the character and size of the seed to be grown. Small seeds require less depth of covering than large ones, because of the lesser thicknesss of corticle, and also because of the weaker germ, rendering it less capable of reaching the surface. Too deep covering, it is well known, will cause seeds to remain in the ground a long time without vegetating. This is in consequence of want of air and heat. Again, this varies with classes of seeds, some germinating freely at a temperature in which others would lay dormant, or decay. Heat with appropriate moisture sets the vital principle in action, expands the air in the cavities of the seed, and produces distension that must either be continued to a healthy growth, or result in immediate death. After being once excited into activity, there is no intermediate stage of repose. It is from a want of this knowledge, that so many are disappointed in their seeds. Early in spring comes a few warm days, when, if seeds are planted, and after a few days examined, they are found all swollen and apparently about to push the radicle or rootlet; next, comes a week or more of biting cold, chilling the earth of the little warmth that assisted in the first state of the seed, and the planter looks in vain for his plant to appear above ground. The check in its then tender state has produced death.

OF ROOTS.

Their Growth.—The immediate cause of roots is one of the mysteries of vegetable production. We know that exclusion from light induces the most rapid development; and, that if to be created other than from seed, woods of a soft cellular character produce them most readily. Moderate moisture is also necessary for their development, and, while they are not buds, yet it is necessary for their production and maintenance, that leaf buds and leaves exist in connection with the stem from which roots are desired to be grown. Practical cultivators, as yet, are all in the dark upon this point of root production; hence the difficulty of growing plants from different varieties of woods.

In seeds, although the first appearance of the root in the embyro plant, at the time of germination, precedes the expansion of the seed leaves, yet the young root will not live unless the seed leaves are enabled to act. Thus, as the root developes itself and pushes downward, the stem and seed leaves grow toward the surface, which having reached, the elongation of the roots is at once checked, and it appears to assume the functions attributable to it in the production of growth in the plant.

That roots absorb food from the earth, extending as the supply becomes exhausted, has been proved; but this enlargement and extension is, at the same time, attributable to the return through the stem of organizable matter, elaborated by the leaf. This return of matter is supposed to form new layers horizontally and longitudinally, thereby creating increased size with extent in length. The correctness of this theory is sustained by the fact that, denuding the tree of its leaves, at once checks rapid extension of the roots; and if the foliage is long kept off, and the starting of dormant buds be prevented, roots and stem soon die. Again, as roots are most active in the spring and early summer, when the foliage is rapidly developing, if the denuding process above named be then performed, death is certain. But, if such denuding process be omitted until midsummer, the roots apparently receive little or no check; on the contrary, they appear to be furnished with the power of perpetually adding new living matter to their points, and continue to extend themselves as the food in contact becomes consumed. Thus, theory, while apparently contradicting itself, is in reality supported; and as roots are never found inactive, except when frozen, this absorption and elongation must arise from continued circulation, however sluggish, and measurably irrespective of the stem, thereby increasing the natural period of rest, and storing up food in the interior, to be distended and vigorously applied to rapid growth on the approach of spring.

As a general rule, roots have no power of choice to absorb elements only adapted to their wants, but they take up everything in a soluble form, and on its reaching the leaves, its healthy or poisonous character becomes visible. Exceptions to this rule have been found, but, as a whole, the rule holds good. It is by some writers held, in theory, that on the return of elaborated juices from the leaves, certain matters, poisonous in their nature, are given off at the extremities of the roots, thus making the spongioles act a double purpose. This theory comes from the fact that, in practice, it is found difficult if not impossible to grow trees healthily in ground previously occupied with the same variety. We incline to the belief that the difficulty arises more from the exhaustion of suitable soluble food in the soil, than from the creation of poisonous elements, by exudation of excrementitious matter from the roots of the previous occupants.

In general, roots have no apparent buds, and, therefore, cannot readily be used to increase the plant to which they belong. Exceptions to this rule are, however, found in the Paradise Apple, the Quince, and many others which readily grow from pieces of roots. We have grown some cherries and pears by this means. So that experiments are requisite to decide respecting each variety.

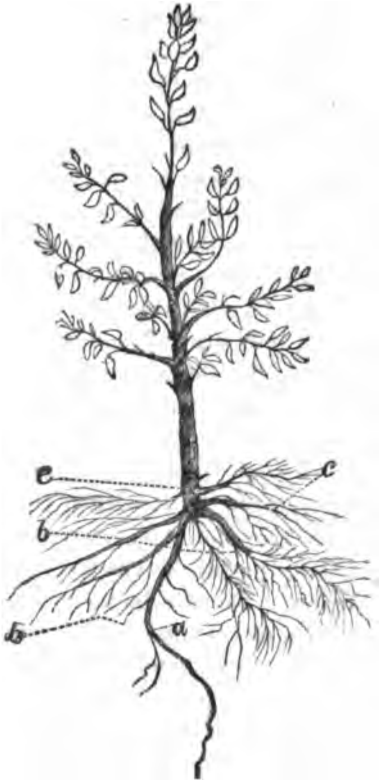


FIG. 3.—*a*, main or tap root. *b*, lateral roots. *c*, fiber or rootlets. *d*, spongioles. *e*, crown or collar.

Roots have, beside these general rules, their separate orders of position and uses, and for a better exposition of the subject, we have sketched (Fig. 3) and marked it as illustrative of the terms in common use for each root or part. *a* is the *main* or *tap* root, which in seedlings undisturbed, if the soil be not too hard, usually penetrates the earth vertically. In this drawing, the tap root originally produced by the seedling has been once cut away, and what we now point out as the *main* root is that root which has become the strongest, and taken the place of the original or seedling tap root. *b* are what are termed *lateral* roots, diverging from near the crown and main root, and usually, if not always, corresponding in number and extent to a like number of branches or main limbs on the tree above. Examination exhibits the fact that if, by some cause, a tree, while young, loses its branches upon one side and extends them upon the opposite, the lateral roots are found to exist only on that side, and immediately under the existing branches. *c* are *fibres* or *rootlets*, not perfectly but in great measure corresponding with the twigs and spur-like branches above ground. These fibres vary in size from that of fine thread to that of a knitting needle. They also vary on roots, and on varieties, according as the trees have large or small, many or few, short twigs, spurs or spray. These fibres are, many of them, produced from a species of buds in the root, and are forced out into existence more and more as the tree is often transplanted, or has its leading main or strong lateral roots shortened by the spade or knife. *d*, the *spongioles* or extreme ends of the fibres or rootlets. These are porous, spongy, and are sometimes called the feeders. It is through these, mainly, that the absorption of food is taken from the soil, although their whole surface, being soft, may and probably does absorb in a greater or less degree; but the principal source of supply to the tree is through these spongioles, mouths, or feeders. When in the soil, they are soft and of a delicate tissue, exceedingly sensitive, and liable to be destroyed in a short time if taken out into a cold dry air. Hence it is that many persons, in giving instructions relative to planting of trees, advise the cutting off of the fibres close up to the lateral roots, whereby new tissue is more readily formed than when the fibre, having been destroyed by exposure to air, is returned to the soil and left to decay on the root. It is attributable to the complete preservation of these fibres, that deciduous trees are enabled to be moved successfully in midsummer. The air being warm, and moisture being added to the soil in its then warm condition, rapid action of the rootlets is induced to supply the continued demand of the leaves. *e*, is the *crown* or *collar*, injury to which is more permanently felt by the plant than any other part. In grafting to change varieties, this point, when it can be done, is selected for insertion of the graft, because of its immediate connection with the root. Seedlings have this crown or collar perfectly developed, while in trees or plants grown from pieces of root grafted below, or detached from the natural crown, this crown or collar is not so readily or so perfectly developed.

OF TREES.

The Stem.—A tree may be said to embrace the stem, branches, leaves, roots, etc., but in the common use of the word the root is usually spoken of in a manner indicative of an independent formation. Upon its successful growth the stem, branches and leaves have each an action, and therefore the one cannot exist without the other. In our showing of the seed we have pointed out that at the time the root penetrates the earth, vitality of the living point that exists at the bottom of the seed leaves is excited, and the plumule or stem with the cotyledons or seed leaves are pushed up. There is, stored up in the germ or embryo seed, material upon which the extension of the root and top both depend, until the latter has reached a point where light acts to create chemical changes in its components, causing it to call upon the roots for supplies; at the same time having in a manner elaborated the juices within itself, it commences sending them downward to the root. During this first elaboration by the seed leaves, the plumule or stem is attracting to itself support, and by the time the nutritive matter supplied by the germ and seed leaves is exhausted, it has become a stem, clothed with leaves, drawing from the root crude material, eliminating it through leaf channels, and returning it prepared to form woody matter, which connecting in its downward course gives toughness and consistency to the cellular tissue, first formed by matter deposited in the seed, and which it encircles by a thin film or fibre a little within its circumference. As this woody substance is formed by matter having passed through the leaves, it follows that the increase of the tree must commence at the base of each leaf; so that a plant one year old will be the largest at the collar or crown, and decrease gradually to the point that produces the terminal or last leaf.

Remembering that each deposit of fibrous, woody matter commences at the base of each leaf, it follows that those leaves last formed have their layers of wood nearest the surface. As the rootlets receive and increase from this returning deposit, and also absorb the food for ascension, and as light and heat are known assistants in vegetation, we have the theory for the terminal or last buds becoming first developed in spring.

These layers, made yearly and perpendicularly, one over the other, as leaf rises above leaf, are designated by the different terms, as *outer bark* or *rind*, *inner bark* or *liber*, *sapwood*, *heart*, and finally the *pith*. Next, as each leaf elaborates its food and returns it toward the root, more or less of it is distributed horizontally toward the centre or heart of the tree, forming a cellular tissue, readily seen by the nettled appearance of wood.

when cut crosswise. These cross layers are called *medullary rays*, serving to connect pith and bark, and while maintaining a communication, hold all parts together. They are formed one each year, and as plainly denote the age of the tree as the perpendicular layers.

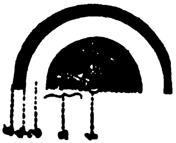


fig. 4.

As an illustration of these terms we have drawn a section (figure 4) of a tree four years old, cut horizontally: 1, The *pith* or soft spongy substance that originally exhibited itself in the plumule or incipient stem. This extends throughout the entire tree by a natural order of cellular deposit in creation or extension of growth by sap forced upward and onward to the creation of leaves, and afterward elaboration, thereby to form the perfect wood. The size of the pith in the apple, pear and quince, and other hard wood trees, is less than in that of the grape or soft wood plants. It varies also in the different varieties of apples or pears; those of the most rapid growth while young having it larger than those of slow growth. This is often caused by the abundance of food found in a state of absorption by the roots in the soil, what is termed rich land giving larger pith to young trees than that of a poorer nature. After the first year's growth, or as soon as heart wood is formed, the pith is of no farther account, and as the trees advance in years the first formed pith commences to dry up and decay. This is shown on cutting down old trees, the centres of which are often found hollow. This cellular system also exhibits itself in deposit at the base of cuttings, and is known by gardeners under the name of "*callus.*" It is the incipient formation of roots. 2 points to the *heart*, or oldest and most perfect wood. Every practical person knows heart wood by its darker shade of brown in color, and they also know that it is more durable; but why it is so perhaps many do not know. The office of the stem is to convey the crude fluid obtained by the roots from the soil into the leaves for elaboration, and then to receive it back again. Now, the sap being collected by the finest fibres, it ascends in direct connection with the wood from which those fibres emanated, and which are attached only to lines of newly formed wood. This is the sapwood as commonly known, and the sap once having arisen through it and passed to the leaves, no farther perpendicular action is required of it; but as the sap, having been elaborated, returns through the liber or inner bark, on its way to the roots, it deposits through the medullary rays, horizontally towards its centre, a portion of its solid parts. This solid matter serves to choke up the perpendicular veins, and consequently that portion of the wood which is the oldest or heart wood, and through which this solid matter has most frequently been conducted by the medullary rays, is the most compact, and, therefore, in practice, found most durable. 3 is the *alburnum* or *sapwood*. This is the part through which the sap ascends. It was formed by the downward current the previous year, and with it are connected the fibres or rootlets. According to the extent of the growing season, and the vigor of the tree, this layer is thick or thin. It is sapwood but one year, becoming a part of the heart thereafter. In the growth of the stem this layer is very nearly even all around, but in limbs or branches it is often, if not always, thickest upon the upper side. It is the connection with this that in grafting is necessary to success.

4, The *liber* or *inner bark*, down which the sap, after having left the leaves, returns to the root, forming on its passage new wood. The destruction of this line, together with that of the sapwood, is what causes death to the tree. It often happens in young orchards that mice gnaw this and the soft sapwood entirely away during the deep snows of winter, and before the owner is aware of it his orchard is destroyed. Every practical man, familiar with the clearing of forests, knows well that the destruction of these two lines, by a process called "girdling," is just as certain destruction as if the tree were cut down.

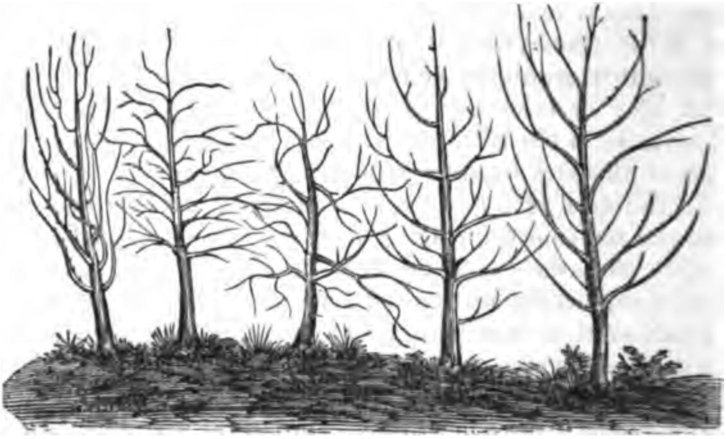
5th—The *corticle rind* or *outer bark*. The use of this part is merely as a protection to the liber or inner rind. During the first growth of the stem it is very thin, and easily separated from the parts beneath; but, as the tree grows older, it unites with the tissue or wood formations, and gradually increases in thickness and strength, being constantly pressed outward and distended. Varying with the health and character of the tree, this outer bark, after a period, separates, and pieces of it shell off; hence the names of rough and smooth bark. In grape vines and some other species this outer rind or bark is shed and renewed annually. As with the root, so with the stem, circulation never ceases except when frozen. This is proved by cutting into the side of a tree in mid-winter. If it is a bright sunny day, the sap will flow readily; if it is cloudy and cold, the sap flows sluggishly, but yet a regular circulation is evident. The term *trunk* is sometimes applied to the stem of a tree destitute of branches several feet above ground.

Branches are continuations of the stem, and among tree growers have different terms to designate the habit and character of the tree. These designating terms it is well for the planter to understand, as many trees are, in the form of their growth, suited to localities and positions in which others would not be well adapted. These terms are, however, generally applied to young trees, for nearly all varieties, as they grow old and come heavily into bearing, have more or less of a drooping character, especially while under the burthen of the fruit.

Figure 5, on the following page, represents a tree with *erect* or *upright* branches.

Figure 6 one with branches that as they leave the main stem have more or less a tendency downward, and are commonly called *spreading;* as they grow old and come into bearing they become almost *drooping.*

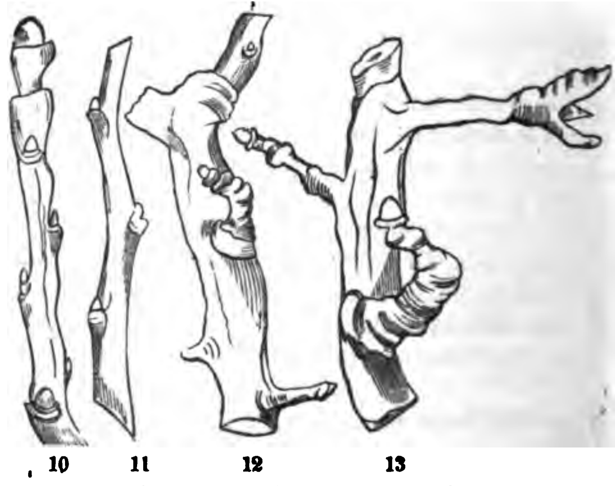
Figure 7 is a tree whose branches are termed *straggling*, as they grow seemingly without any point or design. Trees of this class are objectionable in an orchard, however picturesque they may be in a landscape.



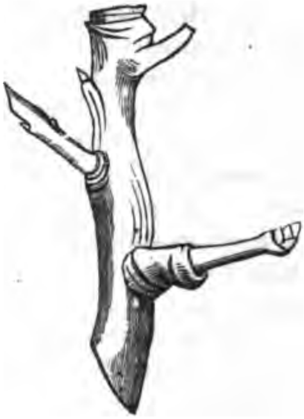
5. Tree with erect branches.
6. " spreading branches.
7. " straggling branches.
8. Tree with diverging branches.
9. " ascending or half erect branches.

Figure 8 are termed *diverging* or curved. Trees of this class usually form regular round heads.

Figure 9 with branches *half erect* or *ascending*. This class is perhaps more common than either of the others. In addition to these terms designating the general forms of branches in making descriptions of trees; there are also *wood* branches, *fruit* branches, *spurs* and *shoots*. Wood branches (fig. 10) have generally long, narrow, acute buds, laying close down upon the branch that produce only wood. These buds, however vary considerably in improved or artificial varieties. Fruit branches are indicated by figures 11, 12, 13 and 14—11 being the first year's growth



At two year's old it shows as in figure 12, and for "two or three seasons it produces but a rosette of leaves, and continues to increase in length as in figure 13. After it has produced fruit, it generally branches, and if properly managed will bear fruit for many years. Apple and pear trees of bearing age, and in a fruitful condition, will be found covered with these spurs on all parts of the head, except the young shoots. In addition to the fruit spur, there are slender fruit branches, about as large as a goose quill, and from six to eight inches in length (figure 15). The buds are very long and prominent, and the first year or two after their appearance produce only rosettes of leaves, yielding fruit about the third year." "Certain varieties of apples have a natural habit of bearing on the points of the lateral shoots, and these terminal fruit buds are formed during the first season's growth of the shoot. Figure 16 is an example. A is the point where a fruit was borne the last season; B a shoot of last season; and C its terminal bud, which is a fruit bud." Spurs are indicated in figure 14; these are often productive of fruit, as is the case with the class exhibited in figures 12 and 13.



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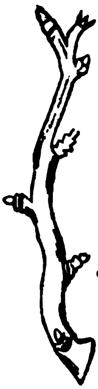

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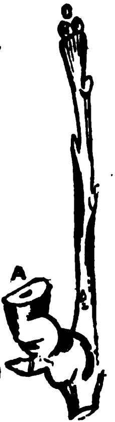

16

Shoots are the young growth of a season, and while young, or during the season's growth, are of a greenish color, but as they become exposed to light, etc., and the food that creates them becomes elaborated, they change—some varieties becoming of a reddish cast, others brown, others yellow, etc., etc. These distinguishing colors of the young shoots, together with the leaf and general habit of the tree, enables pomologists to determine the identity of varieties. Those who are conversant with trees are often enabled to point out sorts correctly simply by an examination of the tree without seeing its fruit. Shoots, like branches, are also in common use designated as *erect*, *spreading*, *stout*, *slender*, etc., and if the buds are close together, they are termed *short-jointed;* or, if far apart, *long-jointed.*

Buds.—All buds are deposits of matter, elaborated by the leaf passages, and partaking of two separate, determinate characters: one the capacity to reproduce a separate plant, if detached from its parent, and partaking in every particular of the habit and character of that parent; or, if left upon the tree, it may become a branch. The other has capacity, from its components, to produce fruit if left to remain upon its parent; but rarely can it be transposed to another tree and continue its natural office. The former is termed a *leaf* bud, and the latter a *fruit* bud. Buds are produced either single, double or triple; the triple almost always having its center a wood bud, while the other two are fruit buds. Occasionally double buds are composed of, one a wood, and the other a fruit bud. As the form of buds varies in kind it is difficult to convey by illustration, any more correct impression than what can be written. Fruit buds are usually rounded, and in spring commence swelling very early; while, as a rule, wood or leaf buds are long, narrow and pointed. Every wood bud is capable, under fitting circumstances, of growing and producing a tree or plant identical with that from which it was taken. Hence the practice of growing grape-vines and many other plants, from single buds, inserted in the soil, where they emit roots and send up a stem, similar to that of a seed; but, unlike the seed, they are fixed in their order of kind, and can only reproduce the parent, while the seed *may* produce a very different variety from its parent. Hence also the practice of budding; when the bud produces wood at its base, and unites, and becomes a part of the tree wherein it is placed.

In the formation of cuttings, leaf buds are necessary to enable the stem to emit roots or branches. In the management of trees, the rubbing away one bud, will serve to excite another one into more vigorous action; hence the practical operator finds that this knowledge enables him to force out branches wherever wanted, and to throw vigor into such parts of the tree as he may desire. Ordinarily buds are not formed except at the point where the leaf springs from the stem, or, as it is termed, the *axil* of the leaf. Such buds are termed *axillary* buds. Occasionally buds appear from other parts, such as the root, or the spaces of the stem lying between tile leaves; these are termed *adventitious* or *accidental*, because of the uncertainty of their appearance. There are often rough spots on the stem, which appear to have, laid up in embryo within, the power of producing a bud, and those who train trees may take advantage of this, to force out a bud and fill up vacant spaces, by means of cutting or wounding the stem.

Leaf buds change to fruit buds, but fruit buds do not return to leaf buds. It usually takes place in the buds that are weakest in the first year's growth; and the change occurs during the second year.

The size, form and prominence of buds is a distinguishing feature in the identification of varieties, of which hereafter.

"Practically considered," says Barry, "buds are classified as follows: *Lateral*, those on the sides or circumference of shoots, being the *axillary* buds of the botanist; *terminal*, those on the points of shoots; *superior*, those on the upper sides of horizontal branches; *inferior*, those on the lower side of horizontal branches; *stipular*, the small, barely visible buds, found at the base of ordinary buds; and *dormant* or *lateral:* these are scarcely apparent buds, generally towards the base of branches. They may remain dormant for several years, and then in some species be excited into growth by pruning close to them."

Leaves.—The influence of the leaf upon the hardihood of the tree, and the production of perfect fruit, has become a matter of great importance to the orchardist, it being well known that such as cast their foliage early in the season, rarely produce well-flavored fruit; nor are they as capable of enduring changes of climate as those varieties that continue their leaves until near the approach of frost, gradually ripening and dropping them late in the season. New varieties of fruits are, therefore, subject to very strict and careful examination by horticulturists, before assisting in their dissemination. "The leaves of all hardy fruit trees cultivated in our climate are deciduous, that is, they decay and fall in the autumn, and are succeeded by others on the return of spring. A leaf is composed of two principal parts; the *leaf stalk* or *petiole*, which connects it with the tree or branch on which it is borne, and the expanded part called the *blade.* The *base* is the end attached to the stalk, and the *apex* or *point* the opposite one. The *length* is the distance from the base to the point, and the *width* a line at right angles from margin to margin. The leaf stalk and its branches, forming the nerves or veins of the blade, are composed of woody vessels, in the form of a tube, similar to the woody parts of the tree or branch that bears it, inside of which is a pith, similar to the pith of the tree: the leaf is thus connected with the pith and wood of the shoot. The veins of the leaf are filled up with a cellular substance similar to the pith, called *parenchyma*, and the whole is covered with a thin skin or *epidermis.* This cellular substance is connected with the inner bark, and consequently the descending sap or cambium, that forms the new layers of wood. Both surfaces of the leaf are furnished with small pores, through which exhalation and absorption are carried on. Absorption is performed principally by the pores of the under surface, and they are the largest; exhalation principally by those of the upper surface. This property of the leaves to receive and give out air and moisture, through the pores on their surface, has caused them to be likened to the lungs of animals; and this comparison is to some extent correct, for we know that, without leaves or organs performing their offices, trees do not grow. And in proportion to their natural and healthy action, do we find the vigor and growth of the tree. To prove that leaves have the power in a greater or less degree to absorb fluids, we have but to apply water to the drooping foliage of a plant, suffering from drought, and see how quickly it becomes refreshed. Dews of a single night we know, too, will revive plants that the heat and drought of the previous day had prostrated.

"That plants *exhale* moisture and gases cannot be doubted. It is this very exhaling process that causes plants to wilt under a hot sun, or in a dry atmosphere. Cuttings of many plants if placed in the earth, with a certain amount of foliage on, and left uncovered, will die; but if a bell, or hand-glass be placed over them, to prevent evaporation, they remain as fresh as though they had roots supplying them with moisture from the soil. It is on this account that transplanted trees so often die, when the branches and shoots are not in proportion to the roots. A tree can neither mature its wood or its fruit, without the full and healthy exercise of the leaves. If in the growing season a tree is deprived of its foliage, growth is entirely suspended for a time, or until new leaves are developed, and the tree may then be transplanted safely, provided the roots are preserved from dying. If the leaves be removed from a tree bearing fruit, we see the fruit shrivel and dry up, or ripen prematurely and become worthless. If roots are not roused into action by the leaves, it is well known they will not continue and grow long, if leaves do not make their appearance; and, in proportion as the leaves increase, so do the roots.

"The fact of the absorption and exhalation by leaves of certain fluids, has to a very considerable extent established the theory that the sap is taken up from the roots, through the cells or sap vessels of the wood of the stem and branches, in a *crude* state; that it passes into the leaves, and in their tissue, being spread out under the sun's rays, it receives certain modifications. Carbonic acid, which has been taken in a state of solution from the soil and by the leaves from the atmosphere, is decomposed, its oxygen is given off into the air, carbon becomes fixed, and thus the component parts of the tree, starch, sugar, gum, &c., are formed. After passing through this purifying or concentrating process, the sap acquires a more solid consistence, and is called *cambium;* so prepared, it returns downwards through the nerves or vessels of the leaf stalk, and then between the wood and bark of the stem, forming new layers on its passage. It has been clearly established, that in the leaves of healthy trees, chemical processes depending on light and heat, and absolutely essential to the well-being of the tree, are continually going on." *

From all observation, it is evident that leaves must derive their food from the earth through the medium of the roots; and it is also settled, that the temperature of the earth and air must have a near relation to each other, in order to continue a healthy action of both leaf and root. Hence the injury to trees by heaping ice and snow around them in winter, and leaving it undisturbed in order to retard their blossoming in spring.

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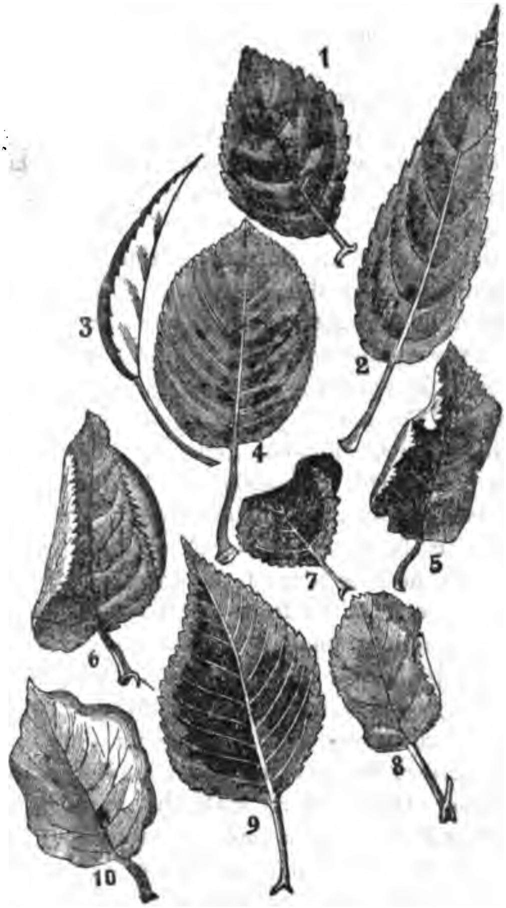
* Barry's Fruit Garden.

The branches being exposed to light and heat, rapid action of the buds is caused, while the root being in a frozen state, has no corresponding action, and the result is, either a lack of supply to the leaf, causing it to wither and fall, or choking up the regular veins near the surface, creating disease, that may be afterward overcome by nature, but that often results in rapid decay. This state of frozen roots, and increased action of the sap in the limbs during warm days of winter, is the cause of what is termed *bark bursting*, so prevalent in young and vigorous trees.

In identifying varieties, the forms and colors of leaves are often serviceable. These forms are not mathematically correct, but comparative. They are illustrated in the accompanying plate of leaves, drawn from specimens selected from different varieties of the apple and pear. Beside the forms, the margins of the leaf have also distinctive traits, indicated in their sharp or rounded points, and these are termed *serratures*. Leaves are also *folded*, *waved* or *flat*, all of which conditions are features that indicate



varieties. In our plate, fig. 1 is *roundish oval*, with *crenate* edge; fig. 2 is *lanceolate* in form, with coarse *serratures* or edge; fig. 3 is a *folded lanceolate;* fig. 4 is *round* or *roundish*, and flat; figs. 5 and 6 are *ovate*, partially folded; fig. 7 is *reflexed*, the point being turned backwards; fig. 8 is *oblong;* fig. 9 is *roundish lanceolate;* fig. 10 is *oblong, waved.* The leaves of the grape are termed *lobed*, as the eges have two, three or more deep angles; they are round lobed, acute pointed lobed, three lobed, five lobed, etc., etc. They are also rough or smooth, as the upper and under surfaces present such appearance; and *downy*, when the under side has a white substance that can be rubbed off with the hand.

Fall of the Leaf.—The fall of the leaf is, in the minds of many persons, attributable to the action of frost; but where no frost occurs the same fall is existent, because of its natural order of duration. Having performed the part allotted to it, the passages are choked up by deposit of sedimentary matter, it changes color, ceases to decompose carbonic acid, dies, and is thrown off. This fall of the leaf is going on from the commencement of early summer until the close of the season. It differs in varieties, some casting leaves numerously even in June and July, others not until near the close of the season.

Flowers.—Flowers are for the purpose of reproducing the species by means of seeds, and consist of floral envelops and sexes. The floral envelops are designated as the *calyx*, or outer covering, with germ-like leaves called *sepals;* and the *corolla*, which is within the calyx and formed usually of showy-colored leaves, called *petals.* In the middle of this flower are placed the sexes. The male organs, called *stamens*, are delicate cellular formations, the stem or filament generally yellowish white, with a little knob at the end called the *anther*, in which is a fertilizing powder called *pollen.* These stamens are immediately inside of the petals; and inside of the stamens, forming the center of the flower, are the female organs. The base of these is termed the *ovary*, and it is here that the germs of the seeds are formed; from this base rises a stem called the *style*, having at its point a small glandular body called a *stigma*, that receives the fertilizing powder or pollen from the anthers, and which is conveyed to the ovary by means of the style. Without the ovary, anthers and stigma, flowers are barren and produce nothing. Most fruit trees have all the parts perfect in the same flower, and so existent, it is called *hermaphrodite.* When the stamens with the anthers are lacking, the flower is called *pistillate*, or female; and when the ovary, style and stigma are deficient, the flower is called *staminate*, or male. Occasionally the stamens are changed into petals, and thus are formed double flowers.

It is necessary, in order to produce perfect seed, that the pollen should become in some manner attached to the stigma. Nature provides for this by having formed the stigma of sticky secretions, and covered the anther with a thin membrane that holds the pollen in its place until the flower becomes fully opened; when it bursts, and the fine powdery substance is scattered upon the air, and, as it passes and touches the stigma, more or less of it adheres by means of the latter's sticky nature. Full and perfect blossoms are sometimes rendered barren by driving, cold storms bursting this membrane on the anther, and destroying the pollen before the stigma has arrived at its period of maturity; for in vegetable as well as animal life, a certain maturity must be reached before capacity to reproduce is formed. This want of maturity explains why, when young trees blossom freely, they produce no fruit; and the prevalence of a storm at the period of blossoming, why it is that trees sometimes blossom all over alike, and yet set fruit only on one side, or the opposite of that from which came the storm.

Hybridizing or Cross Breeding.—Artificial impregnation or *hybridizing*, as it is termed, being the process of crossing breeds in the parents, the product of which it is hoped will present the good qualities desired, and not the bad: it is requisite that the stamens of a flower, *immediately* on its opening, are cut away carefully, with a pair of scissors, and the stigma being watched, fertilizing powder is brought from stamens on another flower, and sprinkled over it, at its period of conception.

In order to make sure of the cross desired being perfect, or, in other words, to be certain the pollen you convey to the plant has not been forestalled in its office, the flower must have been constantly inclosed in a thin, fine muslin or oiled silk, from the time when the stamens were cut away. This, because nature has made provision for the perfect fructification of the stigma, when stamens are deficient in a flower, by means of transmission by currents of air, and by the legs and wings of bees and other insects that flit from flower to flower, feeding upon their honeyed secretions.

In the process of hybridization or cross fertilizing, by means here described, it sometimes happens that the trees that produce the flowers, desired to cross, do not open at the same time; it is therefore necessary to gather the pollen and keep it in fine, soft paper until the flower bearing the stigma be ready. "Pollen of some plants," says Wilder, "may be kept for days, and even carried in the pocket without injury to its fructifying powers."

Heretofore it has been deemed esssential that the two flowers desired to be crossed should open at the same time; and it was also considered necessary that they should be within short distance of each other, in order to facilitate the rapidity of the process. Now, it is found that pollen may be obtained days in advance of the period when it is to be used, and carried miles without injury.

Thus far nearly all the best fruits of this country are accidental hybrids; but recently, with the above knowledge, new and valuable sorts are rapidly increasing, by means of artificial process.

OF STOCKS.

Whether it be for the purpose of obtaining new varieties, or for engrafting other varieties upon, the leaf should be one of the great points to examine when selecting the stock or young tree. If for the production of superior natural varieties, select those with large, thick leaves of a dark rich green color; next, see that the shoots, or branches, have a direction forming a neat, round-headed tree, as such trees expose the most surface correspondingly to the light, and therefore produce the greater proportion of well-ripened fruit. Another thing in selection of the shape, is the fact that, as are the branches, so are the lateral roots; if very erect, then the roots run downward correspondingly; if very spreading, then most of the roots are near the surface. A medium is therefore to be recommended, as giving, in addition to what we have said of the top, a more uniform and equable position of the roots; whereby they have sufficient hold in the ground, and at the same time be within reach of air and the application of manures. The color of the shoots is said to indicate, in apples, the color of the fruit they will produce; as, a reddish shoot, a red apple; a greenish shoot or young stem, a green apple, &c. This requires more experiments to determine its truth.

When engrafted upon, stocks have only the power of adding to or reducing, by means of their roots, the vigor of the variety worked upon them; while the graft, by its elaboration through its leaves of the sap, controls the formation of its wood and fruit. Each end of the tree, therefore, retains its original identity. If a tree of a sickly habit be engrafted, no matter what the strength and vigor of the seedling stock, it will retain that sickly habit, and when it dies, the root goes with it. If, on the other hand, one of vigorous habit be engrafted on a dwarf stock, it will continue its vigor, until the point of union between it and the stock becomes broken in its courses of sap vessels, by the greater increase of the top over the root; it then commences to form fruit buds, because of the check caused in return of sap, and therefore its application to increase, and maturity of the bud: this is the condition of what are termed dwarf trees.

The health and origin of the stock, whether a seedling from a healthy tree or a sucker, should be carefully considered. The former are desirable, while the latter should never be used. Suckers or offsets from the roots of fruit trees, are the production and perpetuation of disease, and liable always to expend themselves more in throwing off the disease by continued production of suckers, than by vigor of tree and healthy fruit. It may be asked, if the stock has no control of the graft, why not use suckers? The answer is, the first sap is supplied by the roots, and ere the leaves can prepare it and overcome the disease therein, the root has exhibited itself in forcing out its diseased buds therefrom; and as the sap has to pass, in its formation of new roots, through it, more or less of its character is retained, and as a "little leaven leavens a whole lump," so the taint of disease thus conveyed is never eradicated, but continues to increase.

In the choice of stocks for grafting or budding upon, examination should be made of them from the first year's growth. The healthy, vigorous plants only should be retained, and the weakly, sickly ones, or those that cast their leaves early in the season, should be thrown away. Next, those stocks that start their buds early in spring should be worked with varieties of a corresponding time of vegetation; and so with those of a later period. This requires care and attention to muck them during the time of starting. Another thing, in selection of stocks, is, "the character of the woods to be united—whether of fine or coarse texture, or of slender or gross growth." Were these points more attended to, we should have less complaint in orchard culture, and less of dispute respecting identity of varieties. We hope to see the time when the tree-grower who uses this care will find the demand for his trees and the price so much in his favor, that it will become a universal practice.

If it is designed to engraft, and thereby reduce the growth and habit of the graft, select stocks grown from seed of a healthy but slow, slender growing tree. Such seedlings generally have a large proportion of small fibrous roots; and as they supply less abundant quantity of sap, the graft is caused to grow less vigorously, and sooner to change its buds from wood to fruit buds, than when worked on plants that have by nature more and coarser powers laid up in their roots. There are varieties of the apple called Paradise and Doucain, that have this fibrous character, and seedlings of the small Siberian crab, and of our native crab, have a similar value for stocks.

For the pear, in so far as anything relative to its propogation upon its own kind, what we have said of the apple is applicable; but, if dwarfing of the top is desired, some other plant akin to it, has to be selected. The mountain ash, thorn and quince, have all been tried, and the verdict appears in favor of the quince. For light, dry soils, the ash and thorn both answer a good purpose. We propagated trees upon them fourteen years since, that are now bearing, vigorous, and healthy.

It has been claimed, by some writers, that stocks do influence the graft on future trees. We acknowledge this in one way, as follows: We have said, in previous pages, that a certain *maturity* must be reached before the fruit exhibited itself in perfection. Many varieties of the pear, it is claimed, are produced better upon the dwarf than upon the free growing stock. Now, as this dwarfing process checks vigor, causes reduction of wood and increased formation of fruit buds, productive and perfect maturity is sooner reached, than when the graft is worked on a vigorous, healthy seedling, of a broad-leaved, strong-growing original parent. In the dwarf, the fruit-producing power is reached at two to three years, while in the free stock it requires from ten to twenty years to reach the same condition. The dwarf, also, by its shape, exposes more of its foliage to the light, and is therefore benefited in greater proportion.

OF SEEDS.

Selection of for Gathering.—Select first a healthy tree of a vigorous habit, and one that holds its foliage well to the last of the season. Examine the wood, and select that of a close, firm texture. Next, the age of the tree is important; as a young or middle-aged tree will impart more vigor and hardihood to its seed than one old and partially decayed. Now, select the fruit, discarding the small and imperfect, or wormy specimens, and taking only those that on opening are found with full and perfect seeds. Lay them in a heap until they commence to ferment and decay; then mash them, and, with a coarse sieve, sift out the seeds and soft particles of the pulp from the rinds; next, place the seeds and soft pulp in a tub of water; stir it up well—the seeds will settle at the bottom; drain off the water carefully, and with it as much of the pulpy matter as you can; cover again with water, and proceed and continue as before until the seed is clean. This is the course that should be pursued to obtain really valuable seeds for stocks. The ordinary way is, to go to the mill where the making of cider or perry is going on, and taking the cheese when thrown off from the press, sift and wash out the seed as above directed. The result is, a collection of seeds, some healthy and many unhealthy—all of which are used indiscriminately, and without regard to the ultimate value of the product, as stocks for orchard trees. After the seed is washed out, if it is desired to be kept dry, it should be spread out in layers, so that it cannot heat, and two or three times a day should be stirred or turned over. Now take shallow boxes, and clean—almost dry—sand; lay a layer of sand, then sprinkle sand and seed, about half and half, and as closely mingled as possible, until the box is full; nail on the cover and put away in a cool, dry room. Seeds kept in this way will grow well if you commence to moisten them about four weeks before wanted to sow. Another way of keeping, is to take shallow boxes, so arranged that water will not remain in them; *i. e.*, make several small holes in the bottom; lay over them thin, flat stones; then sprinkle clean fine sand, say half an inch thick; then a layer of half the thickness of seed, then again sand, and so on, until the box is full. Let the sand be moist. Place the box anywhere in the open ground (but where no mice can get to it), and leave until wanted to sow in spring. In this way moisture acts upon seeds to soften the outer corticle or rind, and fit it for germinating, as much as when sown directly in the ground.

If seeds are to be kept over a year, or longer, they must be very *thoroughly* and perfectly dried before packing, and when put away kept in a cool, dry place.

Packing in charcoal, air-tight cans, and various other modes, have been advised; but practice proves that, with the seed thoroughly dried, and packed in stout brown paper bags, and then again inclosed in cloth, seeds will more surely vegetate, when transmitted long distances, than when packed in air-tight cans, etc.

Seeds that have been long kept, can readily have their germinating powers tested, by soaking in water in which has been placed a few drops of muriatic acid. A common way is, to place a few seeds, imbedded in cotton, in a glass or jar, and after wetting with warm water, cover the glass to retain the moisture, and set it in a warm place; and in twenty-four to forty-eight hours, they will frequently be found to have started. Throwing a seed upon fire is another way of testing: if the seed crack and snap it is good, otherwise bad.

Soil for the Seed-bed.—The soil should be a rich, deep (say twenty inches), loamy clay. A piece of ground that is well drained, and that has the previous year had the sod turned under and then cropped with corn or potatoes, makes a good bed for growing seedlings; but don't forget to plow or dig it *deep*. Use no manure. If you have no naturally *rich* piece of ground, then select the best you have, and work it with plow or spade, as deep as possible, but not less than twenty inches. If it is a sandy or mucky piece of ground, spread on lime at the rate of twenty bushels to the acre; plow it in; spread a heavy coat of well *rotted* manure, and plow that in; each time plowing deep. It is considered by some growers of pear seedlings that muck or peat lands are best for the purpose. Without a deep soil, pear seedlings cannot be grown successfully in this country; and by preparing the soil rich and deep, apple seedlings may be grown as much in one year, as in two by ordinary plowing and the preparation of ground, say four to five inches deep. When ready to sow, make the earth fine by plowing and raking.

Time to Sow.—The best time is the fall; the next, as soon as the ground can be worked in spring.

Sowing the Seed.—Some cultivators plow out a shallow furrow in any good, moderately rich soil, and taking the seed in the pomace as it comes from the cider or perry mill, scatter it altogether thinly along the row, and cover by drawing on the earth about ten inches deep with a hoe. It is a rough, coarse way, but in good strong soils, such as many of our western States have, it yields many vigorous stocks. It is a mode that where land is cheap and labor dear, answers a purpose of supplying the million with trees; but if the object be, as it should be, to grow and improve by its growth, the care we have mentioned in selecting the seed should first be used. Then, having the seed bed prepared with a rich, *deep* soil, mark out rows, and with the hoe open drills, say six inches wide and three inches deep: now scatter the seeds so that they will be about two to three inches apart each way, and with the hoe, or a fine rake, cover them one inch deep with the soil: then take the scrapings from the bottom of an old wood pile, or leaf-mold from the woods, or from a thoroughly decomposed compost manure heap, sufficient to scatter over the additional inches. This latter covering answers as a mulch to protect the ground from baking, drying or burning, and thus renders it the more easy for the young plant to make its first growth.

Distance of Rows.—Those who grow large quantities should have their rows say two and a half to three feet apart, in order to do the work of after culture by means of a horse and cultivator. Those who grow in small quantities and keep clean afterward with the hoe, may make the drills say fifteen inches apart.

Cultivation in the Seed Bed consists in keeping the ground entirely clean of weeds, never permitting them at any time to get over two inches high. After the plants are well up, laying straw four or five inches thick between the rows the first season is even better than hoeing, as it shades the ground and serves to keep the temperature and moisture more constant and regular. If the plants come up too thick, then thin out, so that they can grow vigorously, and if any appear weakly or sickly, out with them. It is better to do it now than to wait two years and then throw them away; beside, they are consuming food that the others may want.

Transplanting to the Nursery.—When the plants have grown well in the seed bed, one, or at most two years, they require to be transplanted, for the purpose of giving each one an opportunity to expand its roots and branches evenly and regularly, and also for the purpose of furnishing fresh soil and food for their continued healthy vigor.

Age to Transplant.—Strong, well grown plants are best to be transplanted at one year. Transplanted at this age, they are or should be large enough for grafting, or if designed to be budded, large enough for that purpose after the coming spring's growth; or if to make orchard trees, their shape can better be formed at this age than later.

Time to Take Up.—The fall is unquestionably the best time to take up seedlings, and we may add, layers of vines. Left in the ground where they have grown, the freezing and thawing during winter lifts many of the seedlings one, two, or more inches out of the ground, and often exposes the roots of the layer entirely to the air. The former, because of having no lateral or side roots to retain their hold in the earth, and the latter because the roots are so near the surface that every frost acts as a lever to raise them.

Covering Layers.—Layers may remain where they have grown if the surface of the ground is covered four or more inches deep with straw, tan-bark, saw-dust, or other light material, to prevent the action of frost.

How to Take Up.—With seedlings, commence at the end of a row; dig away and throw back the soil eighteen inches or more wide, and as deep as the roots of the plants, and a little underneath them; then with the hand draw away the first trees (see fig, 18,) and again dig, throwing back the earth and removing the plants one by one. In this way every tree is taken out with the roots almost entire.

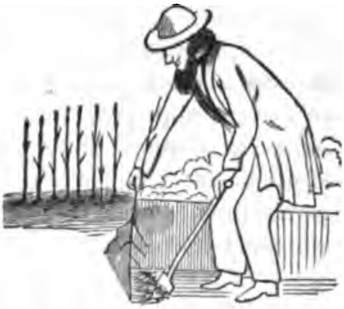


Fig. 18.

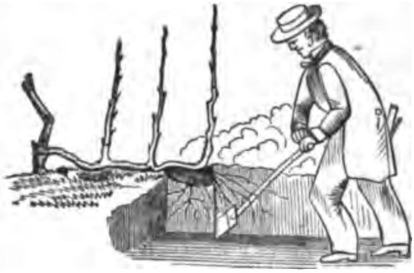


Fig. 19.

With layers, dig well off around the plants and underneath, commencing at the end or last layer on the vine. As you undermine it, the earth drops away and the roots are presented. (See fig. 19.) Separate each plant, by cutting, as you dig. Select a day free from frosty or drying atmosphere for doing the work.

Care of Seedlings when taken up.—Prepare a bed of clear sand in a cool, dry cellar, and as the plants are dug, take them in bundles and place them in their layers in the cellar, scattering the sand well among their roots, to prevent their drying. If you have no cellar, select a spot in the open ground, where it will always be dry: dig a trench and "lay them in by the heels," (fig. 20), that is, cover the roots and a few inches of the trunks or stems with earth, the tree lying at an angle of about 45 degrees.

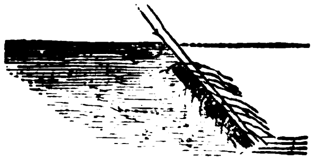


Fig. 20

Sorting.—At the time of digging sort them out: that is, select the largest and strongest growers, and lay them by themselves; then the next size, and so on. By doing this, when you come to replant or graft, each size will be by itself, and your rows will be uniform in growth.

Soil for the Nursery.—If your soil is sandy or clayey, it should have been cultivated in some hoed crop the previous year, and kept *clean of weeds.* If sandy, spread about twenty bushels of lime to the acre, plow it as deep as a two-horse plow can be made to run, and follow that with a subsoil plow, thus loosening the soil twenty-two to twenty-four inches deep. The Michigan Double Plow and Mape's Subsoil Plow are two good plows for the purpose. Now spread on a heavy coat of well-rotted manure, and turn it under with a one-horse plow three to four inches deep. Sow three hundred pounds of plaster (gypsum) to the acre, and leave for the winter. Early in the spring, as soon as it is possible for earth to be plowed—for early plowed ground gives the best summer's growth—cross plow, with the Double Michigan and Subsoil plows, harrow with a fine harrow, and it is ready for planting. If your soil is clayey, or a loam with a stiff subsoil underlying, first set about underdraining it, putting in drains of tile every thirty to forty feet apart, as it is wet or comparatively dry. Let these be not *less* than two and a half feet deep: it is better to have them three and a half feet. For sandy soils, plow as directed above. Use the lime in place of manure for the second plowing. If rich as most of our western soils, no manure or plaster is needed. In spring, cross-plow and harrow as soon as it is dry enough to work up light and mellow. Finish all by rolling, which helps to crush lumps and set the earth evenly.

Preparing the Stocks.—All seedlings have, as we have described, long tap roots. Sometimes they are pronged. These should be cut off one-third to one-half, with a sharp knife, and the tops shortened to correspond and make a balance. The former is for the purpose of increasing the tendency of the plant to throw out lateral roots, that will in future years be within reach of air and manure, and the latter, that the sap stored in the root may be devoted to a less number of branches, and therefore cause in what remain a more vigorous growth than would be were all left to absorb the reduced supply in the root by means of its being cut away.

Remove fibres.—Should it happen that you have to expose the roots any length of time, say three or four hours, to a drying wind, then in pruning the roots cut away all the little fibres. It is better to remove them with the knife and leave the plant an opportunity to renew them at once, than to leave them to decay gradually, and thus check the immediate growth of new ones, for if once dry in the air no moisture in the soil will ever restore them.

Stocks from cuttings.—Paradise Apple stocks, Quince stocks, and all others grown from cuttings, have no tap or strong roots, and, unless they are exposed so as to destroy the fibres, they require no shortening, except from the tops. These in all cases, even if the root is kept entire, require some reduction, because of the check put upon the roots in obtaining supplies, by transplanting. In such cutting grown stocks, a little extra care to cut away feeble branches and leave the strong ones, is better than the common practice of slashing them off without thought or care. If the roots have been exposed to injury, then cut them away, and reduce the top to two strong buds.

Selecting ground.—Before replanting look over your land and see which is best for the growth of the different varieties. Select the heaviest and strongest land for your pear and quince roots, the next for the free growing apples, and the lightest, thinnest land for the Paradise and Doucain stocks.

The best time to plant.—When there is no risk of the frosts of winter throwing the plants out of the ground, or of heavy rains washing them out, or packing the earth so as to make the surface hard, then the fall is the best time to plant. As a general rule, very early in spring, varying in months, of course, according to latitude, is found in practice to furnish the least risk and great certainty of success.

Distance to plant.—The distance apart which trees should be planted in the nursery varies with the kinds and with the objects of the planter.

The rows.—Where designed to cultivate with a horse and cultivator, the rows should be three and one-half feet apart for the smaller growing sorts, and four and one-half feet apart for the strong growing kinds or those designed to make regular branching heads in the nursery. When it is intended to cultivate with the spade, two feet apart is sufficient for the small sorts and three feet for the large kinds.

Distance in the rows.—The distance in the rows should be one foot for those designed to make small dwarf trees, such as the Paradise Apple stocks, and eighteen inches for Quince or Doucain stocks. It is presumed that all dwarf trees will be removed to the orchard or garden at one or two years old. For stocks designed for standard orchard trees, and to form good round heads in the nursery, two feet is not too great distance apart; and the same for all designed to be grown as pyramids or half standards. This will enable them to be grown evenly, and with good strong tapering stems, and corresponding roots, that when transplanted will require no staking to hold them in place.

Effect of too thick planting.—One great error—owing to a demand from an inappreciative public for cheap trees—is the growing of trees too closely in the nursery, by which they are run up to straight stems, all the way of a size, and when transplanted the little one-sided root which they have, and the heavy top on a slender stem, requires two or three stakes to keep it in place and two to four years before it becomes a healthy tree. In many cases such trees never become healthy orchard trees.

Good trees cheapest.—One well and correctly grown tree is worth a dozen of such whip stalks. It is better for the planter to pay three prices for stocky, healthy, well-branched trees, that have been grown with an even exposure to light, than to take the common style of tree as a gift.

Marking out the ground.—For large nursery operations set stakes on the line proposed for the row, and with a horse and plow make one deep furrow with the land side of the plow, or furrow running directly upon the line for planting.

Manner of opening furrows.—A person accustomed to the work, with a horse well trained, will open this furrow in a few moments, and nearly true as when done with the spade. In small grounds a line is stretched, and a trench the width and depth required is opened with the spade.

Planting.—Now stretch a line that the row may be straight—as straight rows look better and are cultivated easier than crooked ones—then one man with a bundle of trees under one arm places the tree or stock in place with the other, while another man casts with a spade on its root just sufficient earth to hold it in place. Having reached the end of the row, the first man retraces the line, straightening up the plants and setting them firmly, by pressing the earth at the base of the root with his foot; the second fills in the remainder of the soil, leaving it a little crowning, or rounded toward the line of trees. Another way is for the planter to set the tree, and at the same time draw a little earth to it with his foot or hand, and pressing it in place, while another follows, and with a hoe or spade fills the trench about half full, and after treading and straightening the plants, fills in the balance, leaving it as above. Still another way is where the soil is very fine, light and loose, to stretch the line, and with a dibble, (fig. 23) eighteen to twenty inches long, open holes, and dropping the roots of the plant in, press it tight at bottom, with the dibble, and afterward pass along with the hoe and dress up the row. The dibble may be made of a part of a spade handle and shod with iron at the point.

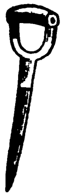


Fig. 23

Cultivation in nursery.—This embraces keeping the soil clean of weeds, light and mellow, insects, pruning, budding, grafting, etc.

First season.—From the time of planting until the budding season, keeping the ground frequently stirred and clear of weeds is *one* of the principal things to be done. In a dry season frequent stirring of the ground will assist it to absorb dews, and thus obtain moisture for the roots of the plant; and in a wet season frequent stirring of the soil, when of a nature to permit, assists it to dry out and aerate. By plowing and cultivating at night, we once kept nursery trees in full vigor and growth during a season when even the leaves of the forest began to droop and look measurably brown. With root grafts the next important thing in starting young trees, is, as buds start, to go over the trees, and rub away all such buds as are not desired, throwing the strength at first into one leading stem, and two lateral branches. If the tree is destined to make a standard, then rub all away but one leading bud. With stocks destined for budding rub away all the buds four or five inches above the ground, leaving all others. This will give a clear smooth stem at the budding season, and prevent any necessity for using the knife, which, if done at that time, sometimes checks the growth, and, consequently, the certainty of the bud uniting.

To Pinch Back Laterals.—The root grafted trees require going over from time to time during the growing season, and when a a lateral branch appears to be taking too strong a growth, overpowering others, and possibly even the leader, pinch it back, as in Fig. 24, putting the thumb and finger nails close to the under side of the bud.

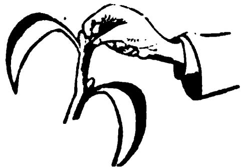


FIG. 24.

Insects.—The pear slug and the black aphis sometimes attack young stocks and trees in the nursery.. These should be watched, and on their first appearance destroyed, before they have time to check the vigor, and growth of the tree by destroying its foliage.

To Destroy.—Sprinkling dry earth, ashes or lime over the slug destroys it, and strong tobacco-water will kill the aphis.

BUDDING.

Time when to do it.—The time for insertion of buds into the stock for the purpose of changing the kind of fruit, varies with the habit and character of both the tree to be propagated and the stock on which it is to be worked. All buds, in order to be successful, must be well ripened—that is, the tree on which they have formed, must have made its terminal bud, or, in other words, the growth of the shoots must present a continuation of perfect formed leaves to its point. This ripening of buds occurs earlier in some varieties than in others: usually early summer fruits ripen their buds earlier than winter sorts. Next, the stock in which the bud is to be inserted must be in a vigorous, healthy condition, but apparently about to close its season's growth. Here again comes the necessity before alluded to, of selecting in the seed-bed the different habits of the young plants relative to early or late maturity. Through our northern middle States, the usual time to commence budding the apple and pear is about the 10th to 15th of August. Further south they are in condition in June; and so on all the intermediate time, according to latitude and season; some seasons being earlier than others by six to ten days.

Such stocks as grow late in the season, should be budded late; because, as new layers of wood are constantly forming with every bud of extension in growth, it follows, if the bud is inserted too soon, it must be covered and destroyed. Again, if the bud be inserted too late, the cambium has acquired consistency, the ripened flow of sap is checked, and the bud having no powers in unison, dies. This has already been explained in previous pages. The quince, from its habit of growing very late in the season, should be the last to bud.

To Prepare the Buds.—If it is necessary, in order to have the buds ready to meet the growth of the stock, that the scion or branch from which buds are to be taken, should be made to hasten its maturing of the buds, then pinch off the end of the shoot one or two buds. In from eight to twelve days the remaining buds will have ripened and fitted themselves for forming either new plants or branches. If this pinching is done early in the season, and the branch left to remain on the tree, the result is, the buds, after ripening, send out new branches, and make a sort of second growth. If scions have to be brought from a distance, or it is desired to keep them several days, wrap them first in damp moss, or failing that, a damp cloth; then inclose that in paper, and the whole in oiled silk. Other material will answer, provided moisture and a cool temperature be kept around and next them.

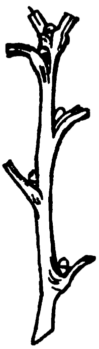


FIG. 25.

Selecting Buds.—When cutting the scion, select healthy branches of medium size in growth, and with full and perfect buds. Cut away the leaves, as in Fig. 25, as soon as you have taken the branch from the tree, as the leaves rapidly exhaust the matter in the bud when its connection is separated from the root, and thus impair vitality. The buds of the upright shoots of a tree are said to make more vigorous and upright growth than buds from lateral shoots; and buds from bearing trees are said to form fruit sooner than buds from young trees. We consider the truth of this as requiring more proof than has yet come to our knowledge; believing that the vigor and condition of the young tree, together with its natural habit, have the controlling power.

Materials Necessary to Perform Budding.—Bands or strings for tying the bud in its place after setting, are requisite; these may be of bass matting, such as is used in wrapping sheet iron or furniture, and which may be also procured by getting the bark of our common basswood—*Tilia Americana*—in the Spring or early summer, and laying it awhile to soak in water, when the outer rind readily peels off, and the inner bark peels into thin, strong, flat strips, that tie easily when wet; woolen-yarn, cotton-wicking and many other materials are used. Anything thin, soft and strong will answer. Bass bark is the best, and should always be wet just before using. A knife (Fig. 26.) with a thin blade, sometimes rounded at the point, and at the opposite end a wedge-shaped piece of smooth ivory or bone.

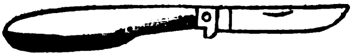


FIG. 26.

How to Bud.—It is surprising that a practice so long in existence and so general as budding, should be so little known in its performance. Practical men have sought out many forms of budding, all, however, uniting in the same principle and object, viz., the securing the growth of one variety of tree upon that of another tree allied to it in kind. The mode called *American* budding is the one now in most common practice, as being the most rapid and also best suited to our hot suns.

Holding the stock in your left hand, and with your knife sharp in the other, make first a perpendicular slit, two or three inches from the ground,

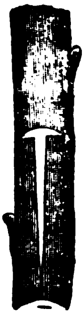


FIG. 27.

on the north or east side of the tree, and about one inch long; then at the top of that slit, make a cross cut (Fig. 27); then with the ivory end of the knife raise the bark a little at each corner below the cross cut, being careful not to injure the cambium or new layer of soft matter just underneath. Next take the scion in hand, set in the knife half an inch above a bud (Fig. 28), resting the thumb of the knife-hand on the scion just below the bud, and make a drawing cut just deep enough into the scion to cut out the bud and a very thin piece of wood with it (Fig. 29), bringing out the knife again half to three-quarters of an inch below the bud. This is the usual length, although the bark may be shorter or longer without injury or benefit. Now put the lower end of the bud into the top of the opening made in the stock, and slide it down, until the bud is a little below the cross cut, and then cut off the end at the cross cut. Next take your strip of bark or tieing, which should be (for ordinary sized stocks) about half a yard long, and commencing at the bottom, wind around, with a steady, even, tight, but not hard strain, until you have covered the whole of the cut and left nothing to view but the bud (Fig. 30); then tie, by holding the last turn around the stock or tree in one hand, winding again with the other, tucking the end under as it comes round and drawing all tight.

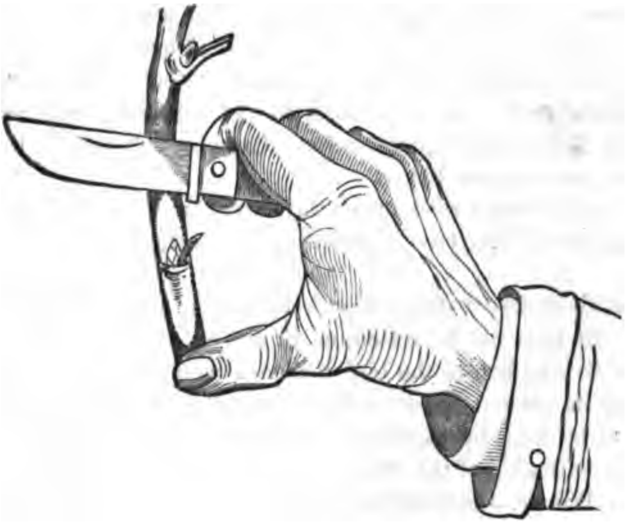


FIG. 28.

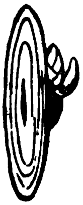


FIG. 29.

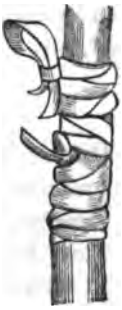


FIG. 30.

Terminal Budding.—A variety of budding, termed *terminal* budding, is sometimes practiced, in order to use the last bud on a shoot. It is performed in the same manner as above, only the tying has to be performed all below the bud.

Spring Budding.—Although the summer is the time for most of budding operations, yet it sometimes happens that a new sort is obtained late in the spring, and, being valuable, it is desired to make every bud become a tree. The scions are, therefore, kept until the trees have made leaves, when the buds are inserted in the usual manner, and as soon as they are united the top of the stock is bent over or cut off, and the sap being forced into the new set bud, it makes a good growth the same season.

The distance from the ground which a bud should be inserted is a matter of some disagreement among tree growers. In all dwarf trees, however, it is essential that it should be near the ground, on account of the necessity of burying all the stock in the soil when it is transplanted. Orchard trees are sometimes benefitted by being worked high up on the stem; as some of the best varieties appear to suffer injury when worked near the earth, and to do well when worked high on a hardy seedling stock. Budding may also be used to change the limbs or branches of a bearing tree, as any branch of not over half to three-quarters inch diameter will answer to bud if it is in a thrifty growing condition.

Care after Budding.—In about a week or ten days after budding the buds should be looked over, and if any have failed they may yet, if still growing, be budded over.

Loosing Strings.—In about two or three weeks the strings will require to be loosened. Some will have to be retied, as if not so done the rapid growth will break the strings before the bud becomes well united. Generally the strings may be all cut loose in from three to four weeks after setting the bud. This is done by passing a knife perpendicular at the back of the bud or opposite side of the tree.

Protection of buds in Winter.—In some locations it is found advisable for the protection of the bud to earth up around and over them during the first winter. This is done in large nurseries by a careful plowman; in small grounds with the hoe or spade. This is not necessary except in very cold, bleak situations, or in soils that upheave badly in winter.

SECOND SEASON.

During the winter the trees should be looked over, and record made of the number and kinds of buds that have failed.

Time to cut scions.—At any time during the winter, or from the fall of the leaf until the swelling of buds in spring. Whenever the weather is mild scions may be cut for the purpose of engrafting. The best time is immediately after the fall of the leaf.

Selection of and how to keep.—Select well-ripened, thrifty shoots, of medium sized wood, of the previous season's growth, from healthy trees. In cutting the scion leave one or two buds of the last year's growth on the tree. (See fig. 32). It injures the tree less. Scions cut at any time during the winter may be kept either by packing them in layers with saw-dust, moss or clean sand in any cool place, such as a cellar, or they may be buried in dry sand out-doors, and shielded from sun and rain by boards. They should always be kept *moist*, but never *wet*. It is better to have them too dry than too wet—as, if too dry, they can be buried in the earth and recovered; while, if too wet, there is often a premature swelling of the bud that destroys them, or they are injured by saturation.

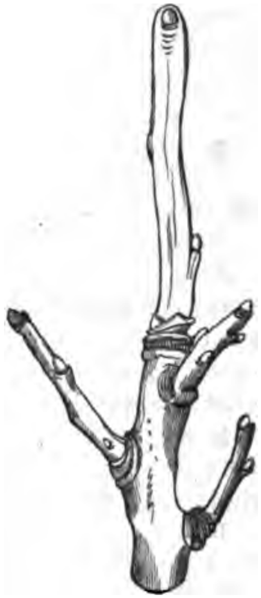


FIG. 32.

Sending by mail.—Scions can be sent by mail by wrapping them in oil silk and tying securely with fine thread.

Implements for Grafting.—In the work of grafting two knives are necessary; one to prune away the stocks and do the rougher part of the work; the other sharp, and with a wide, thin blade to shape the stock and graft for union. Pruning knives, with curved handles and blades, can be purchased at all the seed stores. In cleft grafting a chisel is used, (fig. 33). The blade of this is about two inches long, the edge curved so as to cut and not tear the bark, two handles, each six or eight inches long, with a hook at one end to hang it to the tree when not wanted, and a wedge-shaped blade at the other to hold the split open until the scion is inserted. Grafting machines are also in existence, and for grafting roots in-doors on a large scale are, perhaps, desirable, but are not commonly used, the practice of whip grafting with the knife being generally preferred. Large trees sometimes require the use of a saw; this should have fine teeth and be kept always sharp.

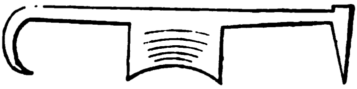


FIG. 33.

Tieing.—Grafts, when inserted below ground, in the root of small stocks, or trees or grape vines, require to be tied securely with bass matting or string, same as used for budding. Those set on trees in the open air require to be both tied and waxed for the purpose of keeping them in place, and at the same time exclude air and moisture from the union.

Grafting Wax.—For this latter purpose get cheap cotton muslin, cut it into narrow strips, and saturate it with a composition made by melting and mingling together three parts rosin, two of beeswax, and one of lard, or equal parts of rosin, beeswax and tallow. In using, these strips are torn up as wanted.

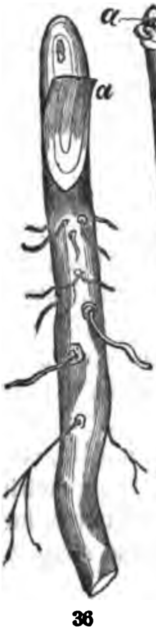
Grafting.—The practice of grafting for the purposes of changing varieties, perpetuating kinds, etc., etc., is much more in vogue at this time than budding; and we cannot but think that to the use indiscriminately of small pieces of all sorts of roots, and the practice of growing trees thickly together in over-rich soils, is in a great measure the cause of so many statements of want of hardihood, etc., etc., that are made from time to time respecting some of the most valued varieties.

Time when.—The usual time for grafting is in the spring; but if scions are on hand it can be done successfully at any time. Grafting pieces of roots is usually done in the house during winter.

Trees suitable.—All trees are subjects for this operation, but they should always be in a thrifty, healthy condition, for no matter how healthy the graft or how good the sorts, vigorous, healthy growth cannot be established on an unhealthy tree. Get the tree into a healthy condition first, and graft afterward.

Modes of.—There are many ways of performing the work, but the practices known as whip, splice or tongue, and cleft and side grafting, are those in most common use; it is not thought best to describe others.

Whip Grafting.—Splice, whip or tongue grafting is best performed when the scion and stock or root are nearly of a size. It is the common mode of grafting pieces of roots. In this, as in all other modes of grafting, have sharp tools, that the cuts may be made smooth and clean; understand the connecting lines necessary to success, viz: see that the inner bark of both scion and stock correspond with each other, so that circulation of the sap upward and wood-forming material downward be not broken. If the lines of inner bark do not meet each other the graft cannot grow. Whip grafting is performed in the same manner on roots in the house as on stocks in the nursery. Its practice on roots in the house facilitates work in the spring, and assists in propagating sorts more rapidly than the old practice of working all in the nursery rows. In performing the operation take healthy seedling stocks, one-quarter to one-half inch in diameter, cut off the top or stem at the collar, and reduce the length of the root to four or five inches, cutting away all fibres; next make a smooth, even, sloping cut, about an inch long, upwards on the collar of the root (fig. 34), then a slit or tongue



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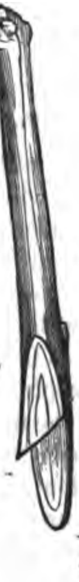
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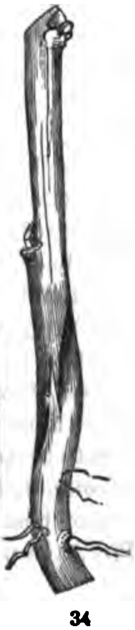
34

downward (a fig. 34, opposite page); now take the scion, which should have two buds on it, cut it with a slope from the upper bud (a fig. 35); next make a sloping cut downwards, with slit upwards on the opposite end of the scion, and corresponding exactly with that made on the root; now fit them closely together, entering the slit or tongue of one within that of the other (fig. 36), examining that the inner back of each are in contact, at least on one side. If neatly done the fit will be so true that they will hold together by themselves, but it is better to secure them by tying with bass matting or yarn, wrapping it round and round, and finishing the tie as in budding. In the open ground this tying should be with strips of the grafting composition cloth, above described, for the purpose of excluding air and rain. When the stock is larger than the graft the wound heals more readily if the opposite side is paired off to a line with the union of graft and top of stock.

Care of Grafted Roots.—When the roots are grafted they should be packed in layers with sand, and put away in a cool cellar free from frost, to remain until spring. Take a box about as deep as the length of the root and graft, lay it on its side, put in a layer of sand, then a layer of grafts, the roots toward the bottom of the box; next sprinkle sand, and then another tier of roots, and so on until the box is full, pressing them firmly so that no air-holes will be left to dry them; nail on the side piece of the box, and set it away until planting time, instructions for which are already given.

Cleft Grafting.—"Cleft grafting is practiced on trees or branches too large for whip grafting—say from an inch in diameter upwards. In this case the scion is cut precisely in the form of a wedge (Fig. 37). The part

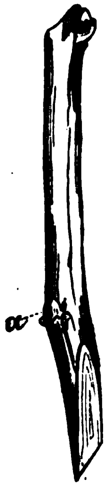

FIG. 37.

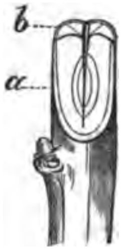

FIG .38.

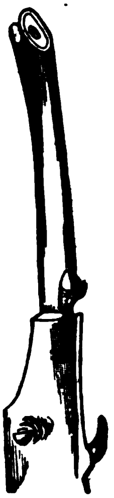

FIG. 39.

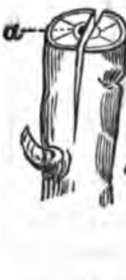

FIG. 40.

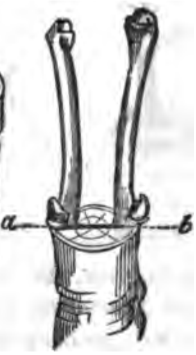

FIG. 41.

cut for insertion in the stock, should be about an inch or an inch and a half long, with a bud (*a*) at the shoulder, where it is to rest on the stock; this bud hastens the union of the parts, in the same way as a bud at the base of a cutting, set in the earth, hastens and facilitates the emission of roots; the outer edge should also be somewhat thicker than the inner. A sloping cut (*a*, Fig. 38) is then made on the stock, an inch and a half long, another cut (*b*) is made *across* this cut, about half way down, as at point *b;* the stock is split on one side of the pith, by laying the chisel on the horizontal surface, and striking lightly with a mallet; the split is kept open with the knife or chisel, till the scion is inserted with the thick side out (Fig. 39). Very large branches are sawed horizontally off at the point to be grafted (*a*, Fig. 40); the surface is then pared smooth with the knife, a split is made with the chisel, nearly in the centre, and *two* wedge-like scions inserted (*a*, *b*, Fig. 41); if both grow, and they are too close, one can be cut away."

"The scion should always be cut close to a bud at the point, and have a bud at the shoulder, or point of union with the stock." Every portion of the split should be perfectly covered with grafting composition to exclude air and water.

Paper to Cover the Wound.—Coarse paper dipped in the composition, and then cutting a slit for passing the graft through, forms the readiest way of covering the wound caused by cleft grafting.

Side Grafting.—The practice called side grafting is used with varieties that appear difficult to make grow in other modes. It is also done to form limbs on stems when required to give correct shape to the tree. We have practiced it successfully with grapes. The stock or tree is cut into with a sloping downward cut, on the side (Fig. 42), and a slit made, as in whip grafting, on the inner side of the cut; the scion is then cut in the form of a wedge, and a slit cut on one side (Fig. 43), corresponding with the slit in the stock; the scion is then fitted in (Fig. 44), and the whole tied, secure from rain or air, with the composition-cloth. When the graft commences to grow, the top of the stock can be cut away, or not, at pleasure.

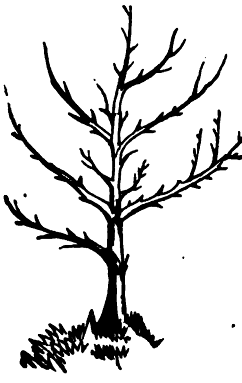
FIG. 42.

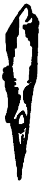
FIG. 43.

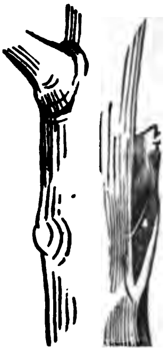
FIG. 44.

Second Year of the Nursery.—Having now explained the modes of grafting, we will go back to the nursery, when such stocks as failed to take the bud, should be cut off near the ground and grafted early in spring.

They will make nearly as strong growth by fall, as the buds. The stocks that were budded last season should be cut off about four inches above the bud, just as the buds are commencing to open; and all buds on the stock, other than the one inserted, should be carefully rubbed out. From time to time the trees will require to be gone over, and this matter of rubbing away the natural buds attended to. As the inserted buds grow, tie up all irregular, crooked or weak-growing sorts to stakes, driven down by their sides. As soon as the growth of the season is about to close, cut off the stub from the stock above the bud or young tree, making the cut so that it will come at the top of the bud or young tree, at its junction with the stock, as shown in Fig. 45. Side shoots, as they appear from time to time during summer, require to be pinched back whenever they grow too strong, or are apparently taking too much strength from the leader. This course leaves the tree, of such varieties as make laterals or branches readily, at one year old, in the shape of a cone, both in the outline of its branches and the shape of its stem.

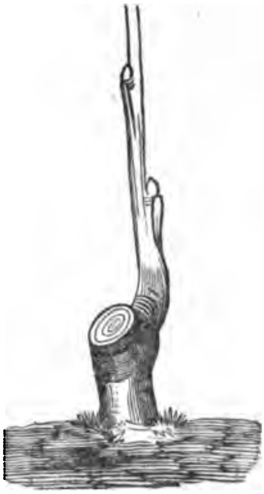

FIG. 45.

Two-year Root Grafts.—The trees on root grafts are this year two years old, or in their second summer's growth, and are in the shape that the buds or nursery-grafted trees are the coming season. Look them over now, and such as are designed to make *half standards*—that is, trees branching two to two and a half feet from the ground, if not already branched—cut them back to the point where you wish the head to form. Some trees make naturally numerous lateral branches the first year, others do not. In cutting back, look well to the buds; if they are prominent, that is, full and stand out well from the stem, they promise to produce branches; if, on the contrary, the buds are feeble in appearance, they are less likely to form branches, and, when cutting back, the latter require to be cut lower down than the former; for if good buds, to make branches, are not already formed, the tree must grow another season before its permanent shape is commenced; and in order to facilitate that, it is necessary to throw as much strength as possible into the lower part of the stem, which can only be done by cutting away the top. This is an apparent loss of time, but is, in reality, a gain, for no tree with a weakly, slender stem can ever become a healthy, hardy orchard tree. The stronger the base of the body of the tree, the more capable it becomes of enduring strong winds, and remaining healthy and productive in the future; and this size of stem can only be obtained by the elaboration of its sap near the crown, and thus form what is desired, viz., a stem tapering from the ground upward to its point.

Starting Standard Trees.—Trees designed for ***standards***, or, in other words, orchard trees, with clean bodies or stems, four feet or more from the ground to the first tier of branches, if of slender growth and without having formed any side branches, will require to be cut back even below the point designated for the permanent head, and for the same reason as given for half standards. If, however, the last year's growth has produced several side branches, and the tree has the habit of making stocky, strong, short-jointed wood, it will only require to have the branches below the point destined for its head, whether ***standard*** or ***half standard***, pinched in from time to time during summer, or until about the close of the season's growth, when they should be cut away clean and smooth close to the stem, as in Fig. 46, and not as in the too common manner, Fig. 47. At the close of the season, the former mode will be found to have each cut nearly healed over by the layers of new wood that have formed. In the early part of the season the elongated growth is made; but it is after the time that the terminal bud is about to form, that the increased size of stem and branch is mostly created. The lateral branches above the point destined to form the permanent head of the tree, should be examined two or three times during the summer, and if any show a disposition to outgrow their opposites they should be pinched back.

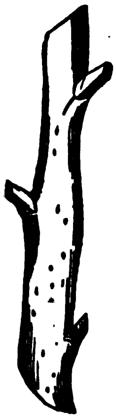

FIG. 46.

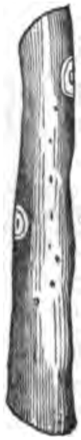

FIG. 47.

To form Pyramids.—To form what are strictly termed ***pyramids***, but generally spoken of as ***dwarf trees***, they must, as we have already said, be first worked, that is grafted or budded, on dwarf growing roots: as the Paradise or crab-apple for apples, and the thorn or quince for pears. The Paradise makes very small trees, more truly called ***bushes;*** while the crab is well suited to pyramids and half standards: with the pear the varieties grow equally strong on thorn or quince. Before commencing to prune it is desirable to look over the kinds, and select for the smallest trees such kinds as either make very short jointed strong wood, or that are of a slender slow growing habit. Some varieties, as stated before, have a tendency to throw outside branches do not. As soon, therefore, as they have made a growth of about one foot, go over them and such as have already started laterals four to six inches above the point of insertion of the bud, will not require any attention except it be to see that no one branch is taking the lead to the injury of others; but those that have not started any laterals should be pinched back to eight inches or thereabouts. This checking of the leader will at once increase the vigor of the buds that have formed on it, and in a short time thereafter they will throw out branches; the stem will also make a new leader of the last or upper bud that was left, and thus the close of the first season will show a pretty little pyramid tree.

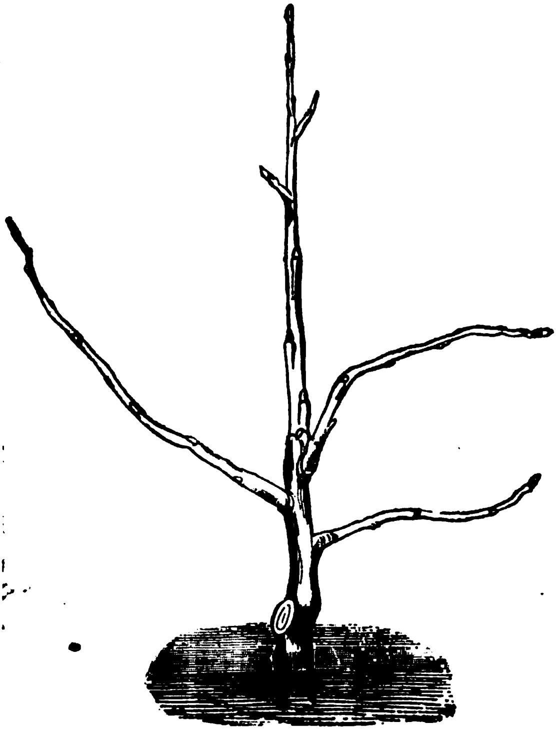

FIG. 48.

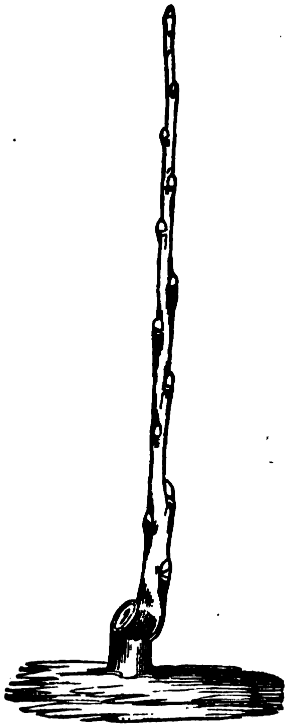

FIG. 49.

Fig. 48 shows the first year's growth pinched back early in season for a dwarf or pyramid.

Fig. 49 shows the same without side branches and not pinched back low down, but left it to be cut back next spring according to its strength and vigor, and for the purpose of making a standard or half standard.

Fig. 50 (p. 576) shows a vigorous plant one year, with side branches of its own natural habit.

Fig. 51 (p. 577) shows the same, having had its branches cut back in the spring, and at the period of summer just before cutting away its lower side branches for the purpose of forming a half standard. It is in the second summers growth from bud or graft.

Third Season.—The opening of the third season with root grafted trees will find them with heads formed, but many of them as yet too small to be removed, unless grown in very rich soil. The same year opens with our budded trees and nursery grafts as in figures 48, 49, and 50.

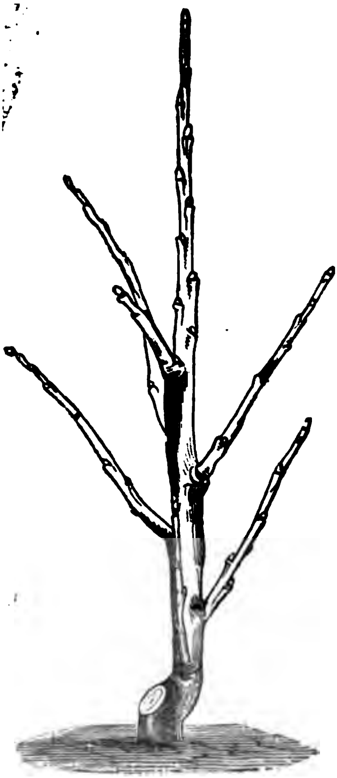

FIG. 50.

If it is now desired to change any of the first named root grafts to standards, then shorten back the lower branches two feet further up on the stem, to about six or eight inches, and at early midsummer cut them entirely away. With the trees budded and now one year grown therefrom, such as have but one single stem must be cut back as we have already explained; and those that have side branches and destined to form standards or half standards, must have the laterals or branches shortened back up to where the head is to be formed, say two or four feet from the ground and at early midsummer entirely cut away.

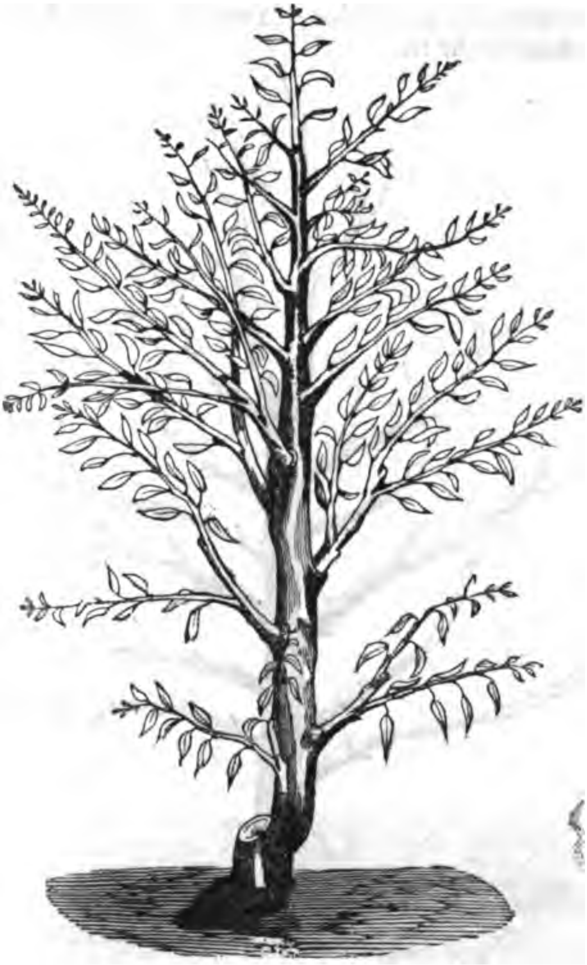

FIG. 51.

The trees designed as pyramids or dwarfs should have their branches shortened in such manner as to leave the lower branches longest and the leader cut back to three good buds. In this cutting, look and see which way a branch is desired and leave the bud pointing that way, as the last on the branch; for whichever way a bud points that will be the general course of its growth.

On this thought and knowledge of pruning a great deal depends in forming the shape of the tree.

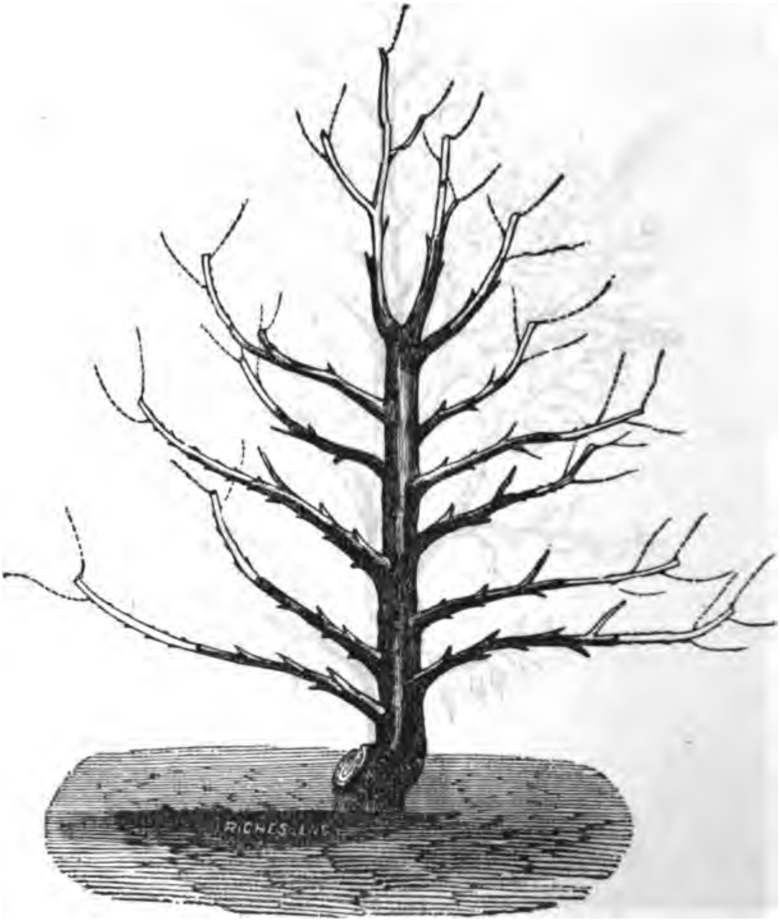

FIG. 52.

Fig. 52 shows a dwarf tree with the buds correctly pruned as to the position of the cut, and the future growth of the bud.

Fig. 53 (p. 579) shows the same incorrectly pruned, leaving points of wood to decay beyond each bud, when, of course, the circulation of the sap is wanting. The dotted lines show the course of growth of the remaining terminal buds. The common practice is to perform this pruning in early spring; but we advise about one week before the first frost of autumn as preferable in any location where the severity and sudden changes of temperature of winter is not liable to destroy more or less of the past summer's growth.

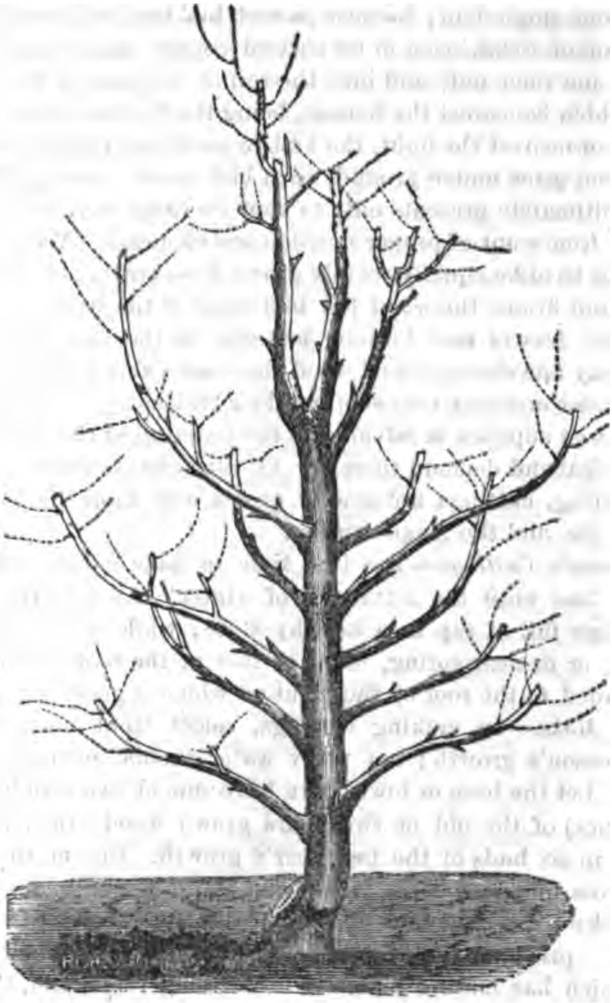

FIG. 53.

TO GROW FROM CUTTINGS.

All varieties of trees can be grown from cuttings; some more readily than others. We have shown under the heading of "Growth of Trees" that each bud is a plant of itself, and that the wood is only a form of currents or tubes for the conveyance of sap up and down from the roots, and possessing in itself no continuing powers; we have also explained that it is the nature of buds to assist in the formation of new wood while on the parent tree, but that detached therefrom and laid in the soil their natural office is to throw roots downward and stems upward, the same as a seed. With this knowledge it follows in theory, as in practice it is found, that it is easier to grow a plant from a cutting made with a number of buds, than from one single bud; because as each bud has laid up within it store for formation of roots, each in its natural course, must assist the other, toward forcing them out, and into the soil at the base of the lower bud. The bud which is nearest the bottom, being the first to emit its roots, and the bud in or nearest the light, the first to swell and form leaves; and as leaves cannot grow under ground, each bud upon a cutting buried from the light, ultimately presents only to view its roots, because of the decay of the leaf, from want of proper position and elements. Why is it that all trees cannot be alike equally readily grown from cuttings? It is because the closer and firmer the wood the less rapid is the current of sap, and therefore the less of root forming material at the base of the cutting, which in very fine close grained wood does not exhibit itself in sufficient quantity under ordinary course of out-door treatment, to create roots and afford renewed supplies in advance of the bursting of the bud and formation of the leaf and demand thereby. Of the subjects connected with our present writing, cuttings are readily grown only from the Paradise and Doucain apple, and the Angus quince.

Time to make Cuttings.—The best time to make cuttings is from the fall of the leaf until the setting in of winter. At this time the buds and wood are full of sap in a healthy state; while if the shoot be left till midwinter or near spring, more or less of the root-forming material has descended to the root of the plant on which it grew.

How to Make.—In making cuttings, select stout mature wood, of the last season's growth; not pithy water shoots, or unripe trimmed branches. Let the base or lower part have one or two terminal buds (or rather inches) of the old or two years grown wood; then let there be about five to six buds of the last year's growth. Cut at the lower bud square across and just below it, and cut at the upper bud, sloping from its top, backwards. The inch or more of old wood, being at the terminal point of the previous year's growth, has several latent buds within it, each of which has mature material for forming roots, and, therefore, as the more root material, the better the reason for its use.

To Keep.—After the cuttings are once formed, they should be packed away in a cool, dark cellar, free from frost, with about one-third of the lower part embedded in damp moss or clean sand; or, better still, the moss and sand, thoroughly mixed. This moss and sand should be kept *damp*—not *wet*—all winter, and by spring the cuttings will be found with tissue root formations, called *callus*, at the base of each one. If no cellar or cold pit is convenient, dig a hole in the ground, on some dry knoll, say one foot deep, then lay in the cuttings with sand among the lower parts, and at an angle as directed in heeling in seedlings. When the cuttings are all in, lay a board sloping over them, to take off from their tops the soaking surface water, and then cover all with earth, heaping it above in the shape of a cone. A careless, but, in practice, an apparently successful way of keeping cuttings, is to cut them as wanted, and lay them in boxes in tiers with sand, the latter surrounding every cutting; put away the box in a cool, dark cellar, and leave until wanted, when nearly every cutting will be found to have callused.*.

Soil for Cuttings.—The preparation of the soil for successfully growing cuttings is an important item; for, having no roots to commence with, the newly forming ones cannot bear wet or drought as well as old, established trees. The soil, therefore, should, if possible, be of a loamy nature, dug or plowed very deep, well underdrained; should have been cultivated the previous year, and had its turf or manure well rotted in it, so that it be now rich in decomposed material to supply the young fibres. No *fresh* manure should be used. Sandy soils are preferable to heavy clays. Prepare the land always in the fall.

Time to Plant.—In climates where the winters are mild, as in the Southern States, the best time to plant out cuttings is immediately after cutting them in the autumn; but throughout most of our Northern and Middle States, it is better to pack them away as above directed, until the first opening of ground in the spring, when they must be immediately planted, so that the young roots may be formed before warm weather comes on and creates increased demand on them through the new leaves. Where only a few cuttings are to be made, the fall is the best time, even in the Northern States; because, being only a few, they can have the ground around them covered with tanbark, sawdust, or other light material, to protect it from the action of frost. In the fall the earth is warmer than the atmosphere, and as heat and moisture are necessary to vegetation, the roots at this season form more readily than in spring, when the soil is coldest.

How to Plant.—In planting cuttings, the position must be regulated by the length of the cutting, its strength and vigor, and a knowledge that a certain warmth is essential to rapid growth of roots. Cuttings, therefore, that are only six or eight inches long, may be planted nearly perpendicular; while those that are one foot to eighteen inches or more, should be laid down at an angle—the angle being always one that will bring the base or lower end of the cutting about five inches below the surface, leaving the upper end bud just out of the ground. The ground being ready prepared, put down the line, and either plow or dig a trench, as for setting seedling stocks or root grafts, and proceed in the same manner to set them, placing them about four inches apart in the row, and treading the earth very firmly at the bottom of each cutting.

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* Pieces of the root of the quince, and many varieties of the apple and pear, will throw up stems if planted with the upper end of the root about half an inch below the surface.

Care of.—Cuttings require the same care and culture as young seedlings, viz: to keep the ground light and mellow, and free from weeds.

Layers.—Propagating trees and vines by a practice called *layering*, unquestionably produces the best plants; and as each plant, in this mode is upon its own, and not upon any foreign root, it follows that in, the production of its fruit, or the vigor and health of its growth, no counteracting influence can be had, as is the case to a certain extent on all trees that are grafted or budded. At this time, with one or two exceptions, it is not the practice of nurserymen to layer any pear trees; and only the *Paradise* and *Doucain* apple. These latter, with the *Angus* quince, are often propagated by layers for the purpose of obtaining stocks on which to bud the apple and pear. One or two nurserymen have propagated the apple and pear by layering, but the practice does not meet with general adoption.

In making layers of the pear, apple or quince, plants designated as *stool* plants are used: that is, small bushy trees of two years old are taken and planted in trenches, about one foot deep, and the trees about three to four feet apart each way. When planted, they are cut back so that they will force out just as many shoots as possible without regard to position.

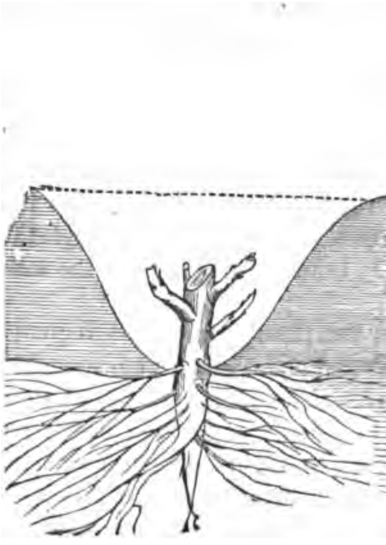

FIG. 54.

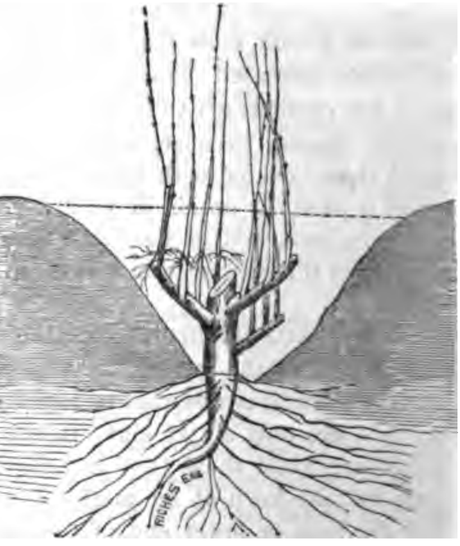

FIG. 55.

Fig. 54 shows a *tree* or *stool* planted and cut back. When the shoots that grow from these stools have about made their length of growth—which is generally about early midsummer—they are looked over and a notch or ring cut around each shoot, and the earth immediately drawn up around and above this notch about two to four inches. Fig. 55 shows a stool with some of the shoots having a notch cut in them, and others with roots as formed the first season. The roots are caused by the descending sap being checked in its downward course by cutting the notch. Sometimes the earth is dug away and the plants are cut off just below the roots at the close of the season and removed to the nursery; but more generally they are permitted to grow a second summer before being removed. The *stool* plant after removal of the shoots, layers or new plants, is well dug around and manured, the tops of the shoots from which the layers were taken carefully trimmed smooth, and then left for nature to again force out buds that become shoots, when the same course, as above, is again pursued. In this way each crop starts its after branches higher and higher up, until it requires considerable labor to mound up the earth around it. When that occurs the plant is taken up, the roots trimmed back, and it is again reset lower down in a new trench of fresh soil.

Layering, by bending down a branch, as in Fig. 56 and pegging it, is performed by first digging and making fine and mellow the earth around the tree; then scraping away about three inches deep, bend the branch as shown and make a cut on the upper side "a," fasten with a peg hook and cover on the earth. Afterward cover the whole soil around the tree and over the layer, two to three inches deep, with saw dust or tan bark. The object of this is to prevent the heat of summer drying the ground so that even regular moisture will be retained at the point of cut on the layer, and thus not check or prevent the emission of new roots, by forming a hard dry surface at that point. The time for layering may be any time from early spring until near the close of the elongated growth of the season. The best wood for the purpose is the growth of the last season, although two year old wood is sometimes used, and occasionally the shoots of the same season's growth. The two year old wood throws out roots less readily, while the shoots of the same year, layered say last of June or early in July do not often make roots sufficiently strong to be removed until another season's growth.

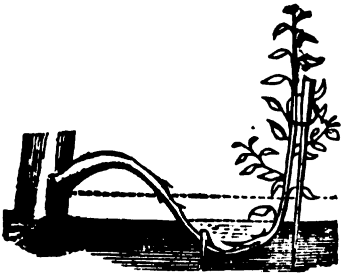

FIG. 56.

Labels.—Labels on trees are essential to names of kinds whether in orchard or nursery. Every tree planted should at that time have a label attached to it telling the name of the kind; and after the labor of planting is over, the careful man will make a map and record of the position and names of each kind of tree, to which he can refer at any time, for years afterwards. Every nurseryman should place his label, with the name plainly written thereon, at the commencement of every row he buds or grafts; and every tree dug from the nursery, before being delivered to the purchaser, should have a label attached.

Labels are made in many ways and very cheaply; some of the most common, as well as useful, are as follows: Wooden labels made from pieces of shingle or inch board, split up into pieces four inches long, one quarter inch thick, and one inch wide; smooth on one side and with two notches cut within about half an inch of one end; to this attach a piece of fine copper wire about six inches long, by twisting it around the label, and then attach it to the tree by twisting the wire around a limb or branch, not the main stem, and just below a twig, so that it cannot readily get off. Paint one side with white paint, and before the paint is dry, write the name with a black lead pencil; it will be legible about four years. This style of labels are now made by machine, and sold at a cost of forty to eighty cents a thousand. Fig. 58 shows one attached to a tree.

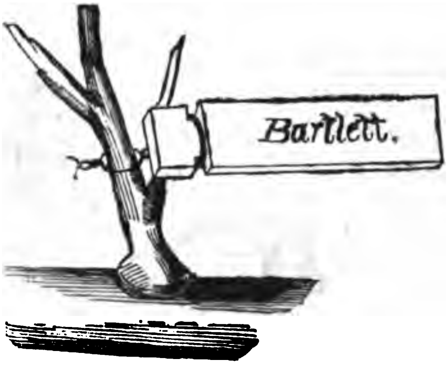

FIG. 58.

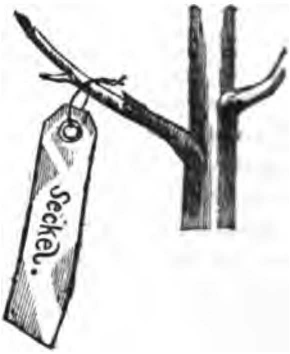

FIG. 59.

Another kind is made of cloth and sold at a cost of about one and a half to two and a half dollars a thousand. The cloth is good, strong white cotton or linen, with an eyelet at one end, and the name printed with printer's ink or written on with a pen—Fig. 59. They are attached to the tree in the same way as the wooden label. Another kind is made of pieces of zinc, tin or lead cut in a triangular form, and written on with the sharp point of any piece of steel—Fig. 60. To fasten them to the tree bend the small end around the branch and again over itself as shown in the drawing.

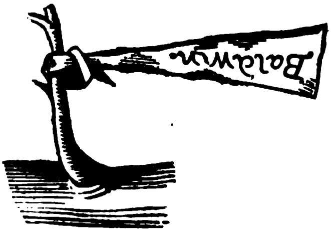

FIG. 60.

Labels for nursery trees are made by taking pieces of oak, locust, pine or cedar, one inch thick, three inches wide, and from sixteen to twenty inches long; smooth one end to write on, and point the other like a wedge, to drive into the ground; paint the upper end with white paint, and write the name thereon with a brush and black paint; drive a label stake at the commencement of every variety.

ON SOILS.

Soil for the Apple Orchard.—The successful culture of the apple depends very much on the suitableness of the ground they are planted in. The size and flavor of the fruit, the general health and duration of trees, is most commonly the result of good or bad, wet or dry soil. Climate, situation and pruning also affect both trees and fruit, but not in the degree in which the same are affected by the qualities predominant in the land. Of all the different descriptions of soil, that of a loam containing a small portion of sand seems to be the most congenial to the apple generally. In such soil the tree is observed to flourish longest, is most productive, and remains most free from disease or attack of insects. A great depth is not requisite, eighteen inches to two feet being quite enough, provided the subsoil be dry or well underdrained. If the bottom be wet tho trees should be planted high, or nearly on the surface, and every means taken at once to drain the ground. Gravelly clays, with wet, springy subsoils, should be avoided if possible, no kind of apple thriving long after the roots once enter such a cold substratum. Apple trees often succeed well in any kind of loam, although only of moderate depth, provided the roots are always free from standing water. In such ground the roots take an extensive horizontal range, and the young wood is always of more moderate growth and better ripened than where roots strike deep into the ground. Deep rich soils are not the most desirable for the apple, though they are often erroneously recommended. Local circumstances often control the wishes of the planter, compelling him to fix on a site for his orchard where the soil is not desirable. In such case he must endeavor to make the soil by draining, and by the addition of qualities wanting, and so bring it as near the standard as possible. Thorough underdraining is essential, and deeply loosening of the subsoil is valuable, but ground may be too rich in certain materials and deficient in others, and so induce a rank watery growth of soft pithy wood, that is easily destroyed by the extreme changes of temperature. Varieties of the apple, as well as the pear, vary in the nature of their components, some requiring more lime than others to perfect their fruit and wood, &c., &c. This matter, as yet, has been but imperfectly understood. It is hoped that, now the Agricultural Department at Washington has employed a competent resident chemist, that it will be carefully taken up, and thus enable the careful fruit grower to decide upon the requisites for his orchard trees as readily as the grower of grains the ingredients necessary in soil to produce plump berry and stiff, strong straw. With a perfect analysis of the components of each variety of fruit, the planter, by having portions of his soil analyzed, could decide correctly the character of manure to apply to each variety. Persons long engaged in the culture of soils, and that have thought of the matter, can judge pretty correctly of its character, but the inexperienced will do well to have recourse to analysis.

Soil for Standard Pears.—Pear roots thrive best in a soil where the subsoil is moderately moist; that is, where it is sufficiently porous to admit of free drainage, and yet where the roots can extend freely and deeply and reach moisture in seasons of extreme drought. Heavy, stiff clay subsoils, when existing in the ground of a prospective orchard, should be deeply and thoroughly subsoiled, then underdrained with tile drains, and finally trench plowed. The pear, however, will thrive and endure longer and better in stiff clays, if underdrained, than the apple, but neither the pear nor the apple will endure healthily what is termed a *wet foot;* that is, water laying at the points of its roots and there becoming stagnant, so far as it is possible to become when not exposed to the air. Such a position of the roots will induce diseases called canker, blight, &c., &c., until in a few years the tree is entirely dead.

Standard pears, planted in sandy soils, come earlier with bearing than on clays, unless such soils are annually richly manured. The reason of this early fruiting is because the supply of food within a given distance of the roots is reduced, and the leaves elaborate it more perfectly, and thus prepare it for formation of fruit rather than wood buds.

Soil for Dwarf Apples.—Dwarf apple trees are generally planted in the garden. The soil should be deeply loosened, thoroughly drained, and if supplied with the requisite materials to form perfect wood and fruit, it cannot be too rich. The root of the Paradise and Doucain, on which such trees are mostly worked, will do well even in a pretty light sandy soil, but good loam is preferable.

Soil for Dwarf Pears.—Pears worked on quince roots generally produce the best fruits in clayey loams. The soil, however, should not be compact, and it should be thoroughly underdrained, so that water will not stand on it at any time over an hour. If the ingredients requisite to form healthy growths of wood and fruit are incorporated in the soil, or the same be applied in autumn or winter to be then incorporated, it cannot be too rich; but be careful not to make the soil rich in components for elongating wood without capacity to form it of a firm, close texture, and avoid applying strong, rank manures during the growing season. Soils composed mostly of vegetable matter, called alluvial, will give vigorous, strong growths, but the wood is soft and spongy and easily winter killed.

OF MANURES.

Animal or barn-yard manures being generally supplied with all or nearly all the components requisite to grow trees and fruits in perfection, they are always to be recommended for the pear and apple orchard, but not always for the grape vine. As we have before stated, it requires a more careful analysis than we now have of the different varieties of fruits, in order to designate correctly—even with a knowledge of the components of the soil—the kind of manure food best to be applied. The size and color of fruit—its quality—the hardihood or tenderness of the tree—the disposition to make wood and not fruit—and perhaps many of the diseases of trees may be changed, either for better or worse, by the character of food applied in the shape of manure to the soil. It is only when we know to a certainty what material certain trees need most of, and in what degree it abounds or is wanting in the soil, that we can apply it safely and profitably. Of animal manures, although they can, if well rotted, be safely applied to all trees and in all soils, yet even in their application judgment and knowledge is desirable. The manure of the hog or of neat cattle is best for light soils, while that of the horse and sheep is most valuable in heavy soils. Mixing animal manures with fallen leaves, weeds, old decayed chips, muck, saw-dust, ashes, soot, blood, soap-suds, night soil, slops from the kitchen, and every other refuse found on a plantation or in a city, forms what is termed "compost manure." "The best gardeners pursue a system something like this:—A trench is prepared two or three feet deep, and large enough to hold what manure may be wanted. In the bottom of this trench, a layer of muck, grassy turf, ashes, anything and everything capable of being decomposed, is laid down say a foot deep, on the top of this a thick layer of stable or barn-yard manure two or three feet deep, then another layer of muck, some gypsum, salt, etc. In this way it remains until more manure has accumulated around the stables. It is then carried and deposited in another layer, with a layer of the other materials on the top. The manure should always be saturated with moisture, and trodden down firmly, to hasten its decay. The layer of muck and other substances, being always placed on the top of the last layer of manure, absorb the evaporations of the heap and hasten the decay of all. When stable manure is thrown down and left uncovered, a dense steam will be seen to rise from it, and this is the very essence of it escaping, to be lost; and if it be thrown down in a heap *dry* it will soon burn, that is, with dry rot. Its enriching ingredients all pass off by evaporation, and there is nothing left but its ashes, so to speak. When the heap has accumulated for four or five months, as described, the whole should be turned over, completely mixed, and piled up in a compact, firmly trodden mass, when it will undergo further decomposition, and in a short time become like paste, in which condition only it is fit for use. Adjoining every manure heap there should be an excavation to receive its liquid drainage, in order that it may be saved, and either applied to the land in a liquid state, diluted with water, or be thrown over the heap." When this compost heap is accessible, all the slop water from the house should be daily thrown over it.

Hon. Marshall P. Wilder gives the following compost as equal to stable manure for gardening and fruit growing purposes, viz: "One cord of meadow muck (having been exposed to the action of air and frost at least one year), twelve bushels leached ashes, six bushels crushed bones. Add to this stable manure, and about one-eighth of the whole bulk of fine refuse charcoal."

Every suburban garden, as well as farm and plantation, should have its compost heap. The refuse slops, bones, etc., that come from the daily life of an ordinary family, composted as above, would furnish manure sufficient for many trees and vines, and it is surprising that knowing its value, so little care is taken to save it.

Best Time to Apply.—The best time to apply any manure is in the fall, but necessity often compels the cultivator to apply it in spring. It is better then to apply it than to let the ground go unmanured.

How to Apply.—For large orchard grounds, the soil should first be thoroughly plowed as deep as it is ever intended to be; then if the soil is poor, spread on say two inches thick of the compost, and plow it under about three inches deep with a light one-horse plow, or with the gang plow and three horses. Then spread on another inch deep over the surface, and leave it until spring. In spring harrow it thoroughly, so that the manure becomes well intermixed with the surface soil. For grounds moderately rich, this one top-dressing and harrowing will be sufficient. Every rain takes the decomposed particles downward into the soil, and a root placed in poor earth, with plenty of good rotten manure *above* it, will grow more vigorously than if planted with manure around and *below* it.

Surface manuring is no novelty, for an eminent cultivator of fruits, nearly two hundred years ago, wrote that "manures should be applied in the autumn, upon the surface, that the rains, snow and frosts may convey the elements of fertility to the roots." Chemists and practical cultivators, knowing that manure must be thoroughly decayed before it is of value, favor the opinion of exposure to the air and other external agents of decomposition.

Of the application of *special* manures—that is of lime, potash, bones, etc., as ingredients necessary for the perfection of wood and fruit, we have already said that as yet the matter is but imperfectly understood. It is well known that all varieties of fruits do not grow and mature equally well in all soils, and it is therefore tacitly acknowledged by all, even those who oppose what they call "doctoring the soil," that something is wanted in order to produce fruit equally alike everywhere. Analysis, so far as we have it, prove that all "deciduous trees require a considerable proportion of potash for the elaboration of their juices in the leaves, and are prosperous or otherwise, in proportion to the supply of that substance in the soil. Liebig has shown that the acids generated in plants, are always in union with alkaline or earthly bases, and cannot be produced without their presence. Now the apple and pear, during their development, produce a great quantity of acid; and therefore, in a corresponding degree, require alkaline and, probably, earthy bases, as an indispensable condition to the existence of fruit." The size and perhaps the flavor of the fruit may be somewhat affected by the organic part of the manure, but its very existence depends upon the presence in the soil of a sufficient quantity of those inorganic or mineral substances indispensable to the formation of acids. "The analysis of the fruit of the apple shows in 100 lbs. of ashes, deprived of carbonic acid, about 13 lbs. of phosphoric acid, 7 lbs. of sulphuric acid, 38 lbs. of potash and 25 lbs. of soda; these four bodies forming about 83 per cent. of the whole ash; while analysis of the ash of the wood exhibits about 16 per cent. of potash, 19 of lime, and 17 of phosphate of lime; and in the ash of the bark about 5 per cent. of potash, 50 per cent. of lime, and 3 of phosphate of lime." Another analysis gives 45 per cent. of lime in the ash of the wood. These two conflicting statements of the quantity of lime in the ash of the wood, only confirms our previous remark that each variety is different in its components; and further, that the same ingredients must be in the soil, in order to grow any fruit perfect as in the soil of its origin. Hence the conflicting opinions respecting the quality of any one variety of fruit in different sections of the country. New recently cleared lands by cutting and burning the timber, have in them greater quantities of potash, &c., than lands that have been cleared many years and regularly cropped. The only inference therefore is, that as these materials are necessary to the health of trees—if trees are again to be planted thereon—such ingredients as have been taken away must be renewed. This, of course, can be done by quantities of animal manures; but such are not always to be had, while specific ingredients can be purchased readily, and the cost of applying be much less than in the bulky form of barn-yard manure.

The analysis of the pear shows a larger per centage of potash and phosphate of lime than the apple. These analyses, however, we consider to have been made very imperfectly or from varieties not indicating more than generalities as to the wants of our best fruits.

The application, therefore, of specific manures must be on general knowledge, but even in this blind manner the results of experiments have been most satisfactory. We once used a weak solution of copperas in water for the restoration of a tree in poor sandy soil. The tree was shedding its leaves and apparently about dying in early midsummer. We made the application by pouring the liquid into a shallow trench just at the outer extremities and just above the roots. In ten days it was forming new leaves and those that had not dropped previous to the application, became a rich dark color, and the whole went onward during the rest of the season apparently healthy. Hon. M. P. Wilder applied a compost of iron and bone dust to pears, to prevent their cracking, and with favorable results. Potash dissolved in water and poured upon the soil, over the roots of trees and vines, has produced wonderful changes in the foliage and fruit. Soap suds, because of the alkalies, forms an excellent manure for all trees, and especially for the vine. Guano and hen manure are very stimulating when applied in liquid form during the growing season. They should never be used dry, except in the fall and should then be incorporated with equal quantities of gypsum. Salt is also a specific manure, and on some soils its effects are very good. While all these can be applied in a liquid form during the season of growth, it is not safe to apply them toward the period when the fruit is about to ripen; and it is always better that they should be incorporated in the soil the previous fall and winter. Whenever applying liquid manures of any kind, be careful to make the dilution weak, let it settle clear, and apply often and in large quantities, and also apply it at the extremeties of the roots—never next the crown.

LOCATION OF ORCHARDS.

In some sections of the country the aspect and position of an orchard requires very little consideration, where the winters are uniform and late frosts do not prevail; the only thing to guard against is the destructive winds in spring and fall. The character of the soil can be changed, as we have directed, by draining and manures; locations can be modified and improved by screens, etc., and varieties can be selected to suit soils; so that no person should ever hesitate to plant, because he has not just the site that some writer has stipulated as necessary to success. There is undoubtedly much in the location, and he who has a dry subsoil with a gentle inclination to the south and east, has naturally an advantage over the owner of level or western sloping land. In localities where late spring frosts and extreme changes during winter are features of the climate, the situation of an orchard upon an elevated piece of land is to be preferred over the level or valley; and if a large body of water be near, the elevated position will have its trees, in a great measure, protected from injury by the warmth given off from the water; for as the warm air escapes from the water it is changed in the atmosphere and the moisture condensed and returned toward the earth over the level land and into the valleys, while the rarified portion rises over the hills. Thus the tree on an elevation is comparatively in a dry atmosphere; and hence the buds are little acted upon by changes of temperature, while the trees in the valley, having their buds swollen by the moisture, are early destroyed. In selecting the site for an orchard general instruction only can be given, and the planter should look over the country and notice the locations where both tree and fruit have succeeded best; and from such guide, with a knowledge of the action of atmosphere on vegetation, in a moist or dry state, make his selection.

Exposure to free currents of air, with at same time protection from the violence of strong winds in fall and spring, is essential to success. Orchards sheltered from all sides rarely succeed as well as those with exposure and protection as above named. Location upon hill sides sloping northerly or southerly are points that have more to do with the early or late maturity of the fruit, than with the hardihood of the tree or its certainty of production. If an orchard is to be planted extending over both slopes, then part of the early ripening sorts should be planted on the north side and a part on the south, thus giving longer continuance of a kind. All the very late kinds should be on the south side.

ON THE INFLUENCE OF BODIES OF WATER.

We have already alluded to the influence of bodies of water upon the buds and blossoms of fruit trees. These bodies of water, however, to be of much actual advantage must be deep, like our lakes, etc. When they are frozen over in winter, the influence is confined only to the prevention of injury from late spring frosts, and not to the protection of the buds in winter. Trees planted on all such sites as the margin or immediate locality of bodies of water, must at the same time be so situated that a free circulation of air is always had, otherwise the influence is in a great measure lost. Every person resident on the border of a large body of water has felt the chill of the wind therefrom, and at the same time noticed that the actual temperature by thermometer would be several degrees above records of locations at distances inland. It is the chilling influence from these winds, that on bright clear days in winter and early spring keep back the buds of trees; when away from their influence they swell rapidly when exposed to the sun's rays. It is this chilling influence that, by preventing the rapid action of sap in the tree, enables its buds to withstand the change of a cold snap that generally follows a half dozen warm sunshiny days in midwinter or early spring. The larger the body of water the more extended is its range of influence; thus, while these chilly winds are felt only when within a mile or so of large rivers, they are evident some five or more miles from large lakes, etc. There is one other influence from these bodies of water that adds to their value as a protection to the fruit grower. It is, that immediately after a cold night following one of the warm spells, spoken of above, the morning's sun is obscured by a fog or mist, being the condensation of the warm air rising from the water, and distributing itself over the land, gradually extracting whatever frost may be in the bud before the bright rays of the sun strike it, and thus save it from injury. The position of bodies of water—whether lying north of the land or west, or south of it—affect very materially the length of seasons or climate, and therefore the character of fruit. The currents of air coming from open water over large bodies of ice, retard the opening of buds in spring from four to six, or even ten to fourteen days, as compared with localities perhaps only seventy to one hundred miles distant, where the prevailing winds come from the water without passing over ice.

OF CLIMATE.

The influence of climate on the apple and pear soils being identical, we consider as no more nor less than that in the longer and hotter season of a southern over a northern location, more of the juices are elaborated, and hence the size of the fruit is increased, its period of maturity hastened, and with the apple its acidity is lessened. Hence it is that many of our varieties of fruits, when originated and grown at the north are good, long-keeping winter sorts, while if grown in Georgia or Mississippi, they become ripe in October and November. And again, varieties that have originated at the south, and are there winter sorts, when grown in the northern States do not ripen, because, according to their nature, they must have a certain period to perfect themselves, and this being shortened by approach of winter, the fruit is only partially matured, and hence flavorless. A change of one degree, nearly, in climate is sometimes caused by the elevation of one tree on a hill and another planted in a valley; both having equal exposure to free currents of air, it is found that the tree on the hill ripens its fruit some days the sooner. This change is reversed if after danger of spring frosts is over, the tree in the valley be sheltered from all exposures but the sunny one. Seasons often exhibit good qualities in fruits that are not again known for years, or until another similar season occurs.

OF CULTURE.

Influence of Culture.—The quality of fruit and its period of ripening, etc., is greatly influenced by the manner in which it is cultivated. Trees abundantly supplied with food in the soil, in a state to be readily taken up by the roots, kept during the season clear from weeds or grass, and the earth around them stirred up loosely, say three to four inches deep every two or three weeks, and judiciously pruned both in the branches and fruit, will mature their fruit so unlike those of the same variety grown in turf or weeds in a common neglected manner, that it is difficult to realize their identity. Let no man suppose that he is cultivating his trees properly when he merely digs a little circle around them. It is labor lost; for as the tree obtains its food by means of its fibres, which are always at the extremities of the roots, and as the roots are always as far extended as the branches, it follows that if he digs a small circle around the tree, and leaves all the remainder in turf, that he has done nothing toward assisting the roots to the food required. "Equally useless or rather injurious, but in a different way, is the practice of deep digging or plowing among fruit trees, thereby cutting off the roots and destroying the fibrous feeders, which frequently extend even beyond the sweep of the branches. However necessary the practice may be of cutting off roots in old orchards in the process of renovation, it should be carefully avoided in grounds properly prepared, and when the trees are in a healthy or bearing condition." Working the soil more than four inches should be avoided, and all manures should be applied in the fall upon the surface, and worked in by the cultivator or hoe in the spring. It is want of cultivation, together with the knowledge of the food required by each variety, that has caused many varieties to be discarded, when under good cultivation they are satisfactory. "In traveling," says J. J. Thomas, "through the country, and visiting the grounds of fruit raisers, and examining the exhibitions of pomological societies, a very marked difference is observed in the same variety as grown on different grounds. In one case it is small and poor flavored; in the other it is large, beautiful, rich and excellent. The owner of the poor fruit is much disappointed in what he expected, and considers himself as "badly humbugged" by the nurseryman who sold him the trees. The successful cultivator takes his specimens to a fair, and sweeps off the premiums with their excellent quality and magnificent appearance. Now the question at once arises, What is the *cause* of this difference? The first and perhaps the most prominent cause is *cultivation*. Place a tree in grass land—or give it no cultivation—let the surface become baked hard like flagging, or allow weeds to cover the surface, and the tree will have a feeble growth, and the fruit, as a necessary consequence, will partake of the condition of the tree. A feeble tree will of course bear small fruit. Hence one reason why young trees often produce larger and finer specimens than old and stunted trees. Cultivation alone has often changed both size and quality in a surprising degree. Some years ago a few trees of the Seckel pear were observed to bear very small fruit. They were then standing in grass, when the whole was subjected to good cultivation. The next crop had pears at least triple in size.

Thinning the Fruit.—There is another requisite for obtaining good fruit, almost as important, and in some respects more so. This is *thinning the fruit on the tree.* And yet it is scarcely ever practiced. The farmer who takes great care not to have more than four stalks of corn in a hill, and who would consider it folly to have twenty, never thins any of the apples on his trees, and they are, therefore, often crowded small and flavorless. The gardener who would allow twenty cucumber vines to grow in a hill, would be called an ignoramus by his neighbor, who at the same time suffers a dwarf pear to bear five times as many specimens as it can profitably mature. The herdsman who should attempt to summer ten cows on an acre of pasture, is not greatly unlike the orchardist, who allows his apple trees to bear more than the trees can profitably support.

Hon. Marshall P. Wilder said in his last address before the American Pomological Society, in reference to the practice of thinning fruits, that "one of the best cultivators in the vicinity of Boston has reduced this theory to practice, with the happiest effect, in the cultivation of the pear. He produces every year superior fruit, which commands the highest price. Some have doubted whether this practice can be made remunerative, except in its application to the finer fruits. But another cultivator, who raises an annual crop of the best apples, assures us that the secret of his success is the thinning of the fruit, and he has no doubt of the economy of the practice."

These two practices—*good cultivation and thinning the crop*—are the foundation for the product of annual crops of superior fruit. "Pruning should not be omitted as an important requisite, but so far as its influence on the fruit is concerned, it comes under the same head as thinning, and is, indeed, a useful auxilary to the latter." An apple tree that is pruned from the top by thinning in from the outside, (instead of trimming and thinning up from below, and leaving the outside as thick as ever) may have the proper number of specimens easily controlled. Orchardists have got to take hold of this matter. Orchards are increasing in number, competition will arise, purchasers are improving in discrimination, and will not be satisfied to pay much for poor stuff. The next twenty years, if the world moves on as it has done, will witness an astonishing education in the masses, in a knowledge of excellent fruit, and in the discrimination between a poor and a good article.

PREPARING THE GROUND FOR ORCHARDS.

Having selected the site for planting an orchard, the next thing is to prepare the soil for the reception of the trees. We have already given instructions for the preparation of the soil in the nursery, and here, as the orchard is to be a permanent investment, not only for our own but probably future generations, all we have said respecting the preparation for nursery trees, comes with additional force. To commence, there are very few soils in which the establishment of a thorough and perfect underdrainage is not *indispensable* to the fruit grower; and there are no soils that are not improved more than the cost of the work by being deeply stirred up and underdrained. Look over the land, then, and see which way the most fall can be had; and then proceed so to arrange it that if you do not the work before planting, you can do it afterward without detriment to the trees. Lay out first the main drains, which should be three and a half to four feet deep, and of not less than four inch tile. Into these arrange for the branch drains to empty, and calculate them to be laid with two inch tile and to be not less than thirty-two inches deep.

The quantity of tile to the acre varies with the character of the soil; wet heavy clays with stiff hard subsoils requiring twice as many drains, as those of a lighter character, and with more or less of an open subsoil. Nearly level lands also require more drains than those that are rolling. "The usual manner of performing the work, and the quickest, is to stretch a line in the direction that the drain is to be dug, and mark it with the spade, as a guide to dig by, on both sides; twenty inches or two feet wide, on the top, will answer for drains of this depth, and let them draw in gradually, so that, when finished, they are wide enough to let a spade or shovel run in the bottom; narrow spades are sometimes used for the last spit, made expressly for this purpose, with a small scraper to take up the bottom. A narrow No. 1 spade, with a long handle, is equally as good, and leaves a smoother bottom for the tile. Where the grounds are limited the draining is always done with spades; the two first spits being good, the soil is put on one side, which will take out twenty inches to two feet; if the shoveling has been taken clean out after each spit, then the bottom, the poorest of the soil, is laid on the opposite side, to be first filled in on the tiles, leaving the best soil for the top.

The cost of digging will depend on the kind of soil; if the bottom spit is hard, so that the pick has to be used, it will make a material difference in the expense. Fifty feet a day for a man, including laying tile and filling in the earth, will be as much as he will be able to do, if the bottom proves hard; but where the digging is easy and the ground soft, he will accomplish seventy-five to one hundred feet, when the depth does not exceed thirty-two inches to three feet. The tiles, where the bottom is hard, require nothing under them, but in spongy, soft spots, to keep them from sinking, a piece of board is sometimes used; each tile lays a foot good measure. Where the ground is flat, or nearly level, the person digging must be careful to carry the bottom the proper depth, which can easily be done by those accustomed to the work by the eye; it ought never to be dug so that the water will stand, but have a gentle fall, enough to carry it all off; the tiles, also, require to be laid as close as the joints will permit, to prevent the earth from falling through, which would impede the run of the water on the tile; care must also be used when connecting the parallel drains with the trunk or main drain, which can be done by breaking out a small piece of tile with a hammer or pick, covering it up carefully with pieces of broken tile, so that no obstruction be made to the water running freely out of the parallel drains.

Some people put a few shavings or straw over the tile before filling in the earth; if they are to be had conveniently they will do no harm, but is not very essential. If the tiles have been carefully laid, this form of draining is the most simple and effectual, and never fails to dry the ground of both surface and spring water, as it is impossible to miss any spring, if the drains are run parallel all through the ground. When stones are in the way they may be used in the place of tiles, but not otherwise, as the cost of carting and filling will be more than the cost of tiles; when used, they are sometimes, if of small size, filled in ten to twelve inches in depth, but, when the run of water is great, they are generally made by laying stones on each side, and covering with a flat one on top, then filling over this six inches of small stones, which makes a capital drain: the cost, however, is double the expense of tile.

Where neither stone nor tiles are to be had, brush is sometimes used, and if well packed and cut up, so that it will pack very close together, ten inches to a foot in depth, it will run water very well, and last for a number of years, if the outlet is kept clear. Where grounds are extensive and rolling, and the grade falling off in different directions, it will be necessary, sometimes, to make more than one trunk drain, but in whatever the ground may be, the same system may be pursued to any extent.

Now, with the draining all finished, and whatever holes there may be in the piece, filled up so as to leave all nearly equal on the surface, put in the plow and subsoil plow. A strong team should be attached to each plow, for it should be an object to loosen the soil just as deep as possible; let the furrows be narrow, not over ten inches wide, in order that the subsoil plow will break up the bottom well. On level lands it is a good plan to throw two furrows together; that is backfurrow every line where the row of trees or vines is to be placed, leaving an open furrow between; this is especially desirable in soils that are inclined to be wet; but on light or dry soils the more completely level or natural the surface is retained the better. After finishing the first plowing and subsoiling comes manuring. If pear or apple trees are to be planted, and the soil has been cropped many years, or until it is comparatively poor, then put on a good dressing of well-rotted barnyard manure or compost, and plow it in about three inches deep; afterwards sow on say two hundred bushels of air slaked lime, and one hundred bushels of bone dust, and harrow it with a fine harrow. When ready to plant cross plow the whole with narrow furrows, say nine inches wide and four inches deep; this will mix the manure well with the soil. If the land is new and rich, use no manure; and if for a pear orchard double the quantity of bone dust. The application of lime, potash, &c., must have its quantity, very much governed by the constituents already in the soil to produce healthy trees and fruit: if new ground from the forest, it will require less than old ground, the previous crops that it has borne will be a good guide toward general instruction as to its wants. If old orchard land it must be recollected that every fruit that has been borne and carried away, has taken just so much from the soil, which must again be returned before new trees can produce satisfactorily.

Double trenching the soil two and a half to three feet deep, and burying manure at the bottom, is one of the old maxims that experience has shown to be both unprofitable and unnecessary.

An important item in preparing for planting an orchard is to see that good and safe fencing is made around the entire plot. Many an orchard of young trees has been ruined by neglecting to provide suitable fencing.

SELECTION OF VARIETIES.

There are a great many things to be considered in the selection of varieties for an orchard or vineyard, and he who selects only those that are in promological terms pronounced as "*best*," may find on fruiting that his wants are but indifferently supplied. "Selections of varieties should in all cases be made with reference to the uses to which they are to be appropriated;" to the hardihood, vigorous and productive habit of the tree or vine; and especially in procuring any number of our variety, to know that it is one that succeeds well in the locality wherein it is to be planted. Some varieties it is well known, with our present knowledge of cultivation, succeed much better in some localities than others: some by reason of soil, some by reason of their period of late or early blossoming, and more by reason of their natural, original location partaking of the same generalities of climate and soil as the location where they are about to be grown.

The farmer, or owner of a small suburban lot, must therefore consider the wants of his family, the object for which he is about to plant, whether for his own use, for market cider, or perry the distance he is from any market, &c., &c. In the first place the number of the family must regulate the proportion of kitchen and table varieties. In the second place the planter must consider how many he will want for sauce, how many for baking and drying, how many for cider or perry, and how many for the dessert, and what proportion of sweet and of acid. These are all considerations that depend upon the habits, taste and mode of living of families, and for which no man can provide or suggest but the planter himself. Then, again, he must consider to what extent it may be advantageous to feed apples to his stock and provide for it accordingly. A hardy, vigorous and productive variety, quite unfit for the table, may be infinitely more advantageous for feeding stock than a feeble growing, shy bearing variety, quite indispensible for the dessert, and an apple may be excellent for sauce, for baking or drying, and unfit for the dessert; these points should all be duly considered.

The market or commercial orchardist must exercise the same discrimination in the selection of his varieties, adapting them to the mode of culture he intends to pursue, and the market he intends to supply. In the immediate vicinity of large cities and towns, where the orchardist may carry his fruit to market in a few hours, the most profitable culture will, generally speaking, be summer and early autumn fruits, or such as require to be consumed immediately after maturity, and are unfit for distant transportation. Early apples and pears will be most profitable for him, because the autumn and winter varieties can be sent easily from the most distant portions of the country, with such facilities as our present system of railroads, canals and steamboats afford.

The market grower of the interior will find his most profitable culture to be principally autumn and winter apples and pears, because they can be packed and transported to a great distance with safety, and the comparative cheapness of his lands enables him to compete advantageously with those more favorably situated in regard to market. The trees of all fruits intended for profitable orchard culture, should be hardy, vigorous, and productive. The fruits should be of good size, fair appearance, good keepers, with skins not easily bruised, or if bruised that do not readily show it, and of good quality. As a general thing—taking the markets as they are—the great bulk of consumers prefer fruit of tolerable good quality and moderate prices, to the very best at two or three times the ordinary price. The most profitable varieties will be those that can be produced at the least expense, provided always that they be *good*.

OF THE SHAPE, SIZE AND AGE.

Next to the selection of varieties comes the selection of the trees, their shapes, age and size. From what we have written of the method of forming trees in the nursery, it is at once apparent that we advocate only such forms as are capable of supporting themselves by means of their own roots, and not by stakes when transplanted. It is cheaper to pay two prices for a stalky, well-shaped tree, with roots that will enable it to sustain itself in an upright position, than to receive as a gift trees with long even-sized stems, and such small roots that stakes are required to support them for years. "Experience is beginning to teach people that whilst tall standards in an orchard possess the single advantage of admitting the operations of the plow under the branches, low standards are much more secure against the numerous fatal diseases that attack the trunks—are much more accessible for the performance of all the necessary details of management, and for the gathering of fruit. These are all very important advantages, but the most important one is the safety of the tree against diseases of the trunk. In all parts of this country we have a powerful sun in summer, and in winter and spring sudden and violent changes from one extreme to another; and experience has shown that the trunk and large branches, being fully exposed to all external influences, are generally the parts first attacked with disease. Except to meet the wants of some particular circumstances, no standard tree should have a branchless stem above five feet in height; four is preferable for all except orchards of common apples for cider or stock. Trees with heads only four feet from the ground are always easy of access, and the natural spread of the branches affords a great protection to the trunk at all seasons." Such trees are the most desirable for the farmer's orchard, while for the garden or small fruit grounds, the half-standards, as they are termed—that is, trees with branches two feet and a half from the ground—are to be preferred for the free-growing apples or pears on their own natural stalks; but all varieties that are to be grown as dwarfs —that is, pears worked on the quince root, or apples on the Paradise or Doucain apple—should branch as near the ground as possible, and from either pyramidal shape or round open-headed bushes. "Trees in these forms are, in the first place, in keeping with the limited extent of the garden, and convey at first sight the idea of fitness. In the second place, they give a great variety on a small space, for three or four such trees will not occupy more space than one standard. In the third place, they are in a convenient form for management, they are easily pruned or protected, and the fruit is easily gathered, and less liable to be blown off than on tall trees. In the fourth place, they bear several years sooner than standards. Among the form mentioned, the pyramid is certainly the most beautiful, and in the best fruit gardening regions of Europe, where almost every conceivable form of tree has been tried, it is the most popular, because it has proved the most advantageous and successful. Certain varieties are moderate growers and early bearers, and will make good pyramids on free stalks, but they will require more summer pruning and careful management to keep their vigor under check than they would on the Doucain. But apples for the fruit garden, even on the Doucain, should be such as naturally make small trees, and are inclined to early bearing. In these respects it is very well known there is a wide difference between varieties. This is a point that should always be looked into in selecting garden trees, for it is the natural and proper desire of every one who plants a tree in the garden, to obtain fruit from it as early as possible.

The pear is eminently *the* tree for the pyramidal form, either on the free stalk or on the quince; on the latter, however, the trees bear much earlier, are more prolific, more manageable, and consequently preferable for small gardens. Certain varieties, however, do not succeed as well on the quince, but the majority of melting varieties do, and produce larger and finer fruit on it than on the pear stalk. People, therefore, who wish pear trees for pyramids that are easily managed and will bear early, will select those on quince stalks, in case the varieties they wish to cultivate have been proved to succeed well on it. The age and size of a tree is of far less consequence than its form. A young two year old tree, with its branches correctly started to form such a tree as is wanted, is far more desirable than a tree four or five years old with no shape or form. It is much easier to grow a tree one year than it is to correct the form of an old misshapen tree; in fact, a tree once started with a bad form and having reached the age of four or five years, had better be thrown away and a yearling obtained, than to expend time and labor in attempts to improve it. If trees are small when obtained from the nursery, it is a good plan to plant them out in rows of about four to six feet apart, in a good piece of soil, and there grow, prune and shape them for two or three years, when they can be removed to their permanent places in the orchard or garden with a small loss of roots, and with very little additional labor over that of the first planting. By selecting moist weather for the work, and using proper care, such trees can be moved so that they will hardly feel the change, or exhibit any particular check in their next season's growth. When trees are to be obtained from a distant nursery young trees are much to be preferred, because when taken up, packed and transported, both roots and tops suffer less injury and breakage than those of four or five years of age. If, however, trees well-shaped, large, and of bearing age, and that have been regularly worked, so that they are thrifty, can be obtained from a nursery within a half day's drive, they are worth just so much additional in value as the fruit they will bear for so many corresponding years, as they differ in age from younger ones.

SEASONS FOR TRANSPLANTING.

Trees can be moved at any season, but the expense and labor consequent upon doing so with success when they are in leaf is so great that it is rarely practiced. Any time from the fall of the leaf in Autumn, until the swelling of buds in the Spring, provided the weather be not cold and frosty, it is safe to transplant trees, and if proper care is used in taking them up with abundance of roots, care to protect the roots from drying winds or frost, care in selecting the ground or preparing it, so that water will never stand an hour upon it, and care when planting to pack the earth well among the roots, success will be the general result. But while trees can be successfully planted during all this period, there is one time that, when the winters are not extreme, may be considered as *best:* it is as soon in the Autumn as the first hard frost has effectually checked all vegetation. If then the leaves be removed, the drain upon the roots is stopped, and if the tree is at once removed, and the broken roots pruned smooth, the returning sap to the roots at once forms new tissue that grows into rootlets when placed in the soil. At this season, also, the ground being warmer than the atmosphere, the roots are stimulated and often send out new rootlets that fasten in the soil, absorbing and storing up new food before the cold of winter.

DIGGING THE TREES AND PRUNING WHEN TRANSPLANTING.

Digging the Trees.—When ready to transplant it is essential to the value of trees, their future growth and vigor, that in taking them up as much as possible of the root be left upon them. Some tree growers, in digging, run the spade straight down about four inches from the tree, cutting off all the strong roots, and most all of the fibres, and then, with a twisting pull, take the tree from the earth with about one-fiftieth of its actual roots. Trees dug, or rather grubbed, as it may be called, in such manner are hardly worth the labor of resetting, and he who pays for them throws away his money. The proper way to dig the tree from the nursery is to dig a trench each side of the tree, and about one foot from it, holding the spade with its side edge, not its face, toward the tree. In this way the roots are little injured by the spade, and after the trench is dug as deep as the bottom roots of the tree, run the spade underneath, and while one man raises upon it, another by setting a foot each side of the tree and beyond its roots, pulls steadily and evenly directly upward, thus raising the tree with all or nearly all its principal roots, and many of its fibres entirely uninjured. Fig. 61 shows roots badly dug, and fig. 62 the same correctly dug.

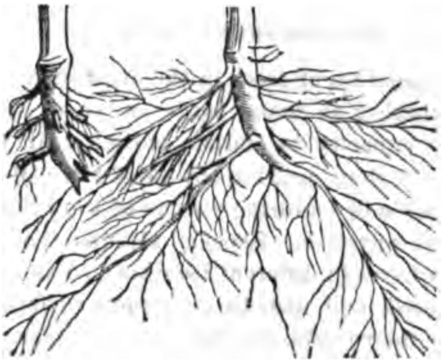

FIG. 61. FIG. 62.

These remarks apply only to trees to be obtained from a commercial nursery. If a person has trees on his own grounds, he should take a sharp spade and cut down around them early in Summer, cutting off all the large roots, and thus causing them to throw out at such points new layers of fibres or small roots, and, when about to dig them, he should dig his trench, just outside, say six to eight inches, of the circle or line at which he cut the roots, and then work under the tree with the spade so as to lift it from the earth with its roots entire.

Having the tree dug the next thing is, first, to examine its roots, and with a sharp knife cut the ends of every root with a sloping cut upward from the under side, or so that when it is placed in position for the earth in replanting, not one of the cuts can be seen from above. In some trees, especially quince roots, masses of fibres sometimes form that need to be thinned out, for when replanted every root should be completely surrounded with soil, and not lay one root upon another; if this latter is permitted, air gets in, the root dries, circulation of the sap in the root is checked, and eventually death to so much of the root, affecting, sometimes, the whole tree.

Pruning the top of each tree should be regulated by the loss of its roots in digging, and also to the shaping of its future form. Some sorts, if well taken up, with little loss of roots, have naturally such slow, stocky open growth as to require little or no pruning; others have a straggling, loose habit, with many little cross branches, and such must necessarily be cut away either entire, or so much that their after-growth will form a tree of the shape desired. Regard must always be had to the keeping an even balance of top and root, that is, as many and as long and large roots as branches, for when the branches and shoots are of double the size, length and number of the roots, they will produce leaves but the absorption of the roots bring so much less than the exhalation of the leaves, the juices contained in the tree, previously laid up, soon become exhausted, the leaves droop and wither, and the tree dies.

ARRANGEMENT OF TREES.

In arranging the position of trees in the orchard regard should be had to their habits, whether to make large or small trees, spreading or upright, and their capacity to endure storms and winds—large fruit blows off more easily than small sized—and trees of a rank, succulent growth are less capable of enduring storms of wind than those of a close, firm, although slender growth. Especial attention should be given to the placing of early varieties in different locations, so as to have their period of ripening continued, and also to give such varieties as require long summers to perfect their fruits, the warmest and most sheltered position. The position of trees with regard to varieties, and their period of ripening should also be considered, and so far as possible all trees of one variety should be planted in connection, and next to them those ripening immediately thereafter, placing the autumn apples contiguous to each other, and so the winter sorts. It is also desirable to have those designed for stock by themselves, and those for cider near each other, and, farther, in barrelling for market or the home cellar, it will be found convenient to have the red skinned apples near each other, and the white or yellow ones by themselves.

The quincunx manner of arranging trees in the orchard, is generally preferred to the older method of simple squares, because it enables the planter to put more trees on the same piece of ground, while it gives every tree more equal room for its permanent growth. Fig. 63 exhibits the manner, by which it can be seen the lines of rows of trees are nearer one way than the other, and yet every tree is equally distant one from the other. To mark out a piece, let us suppose it is designed to plant the trees twenty-five feet apart each way, the rows one way would be about twenty-one feet, which having marked off, proceed to set the trees twenty-five feet apart on the row, leaving a vacancy at the end of every other row of twelve and a have feet from the outer line of the plot. Exact measurement must be made, and it is always best to set stakes before planting, in order to be certain the measurement is correct. The intermediate distances marked by the stars may be filled with dwarf trees, and thus the whole ground used—each tree being twelve and a half feet apart. In arranging trees in small gardens, the simple square method is a good one; but here, for both effect and convenience, care should be taken to have trees of a similar habit and form arranged together, with the earlier sorts on the outside, and the late autumn and winter sorts in the centre of the squares, supposing the garden to have foot walks, and be arranged in regular plots.

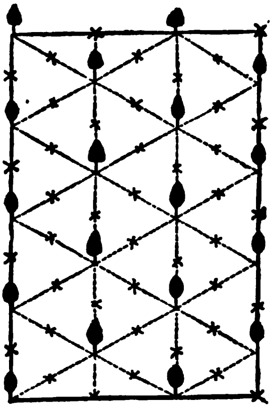
Fig. 63.

Distance apart.—There can be no established rule, except a general one, for the distance apart at which to plant apple or pear trees. The character of the soil will cause a variety in one location to become one-third larger than the same sort in another location, and with inferior soil. Again, the habit of one tree being very upright, and another widespreading, the first would have abundance of room at a distance that would cause the other to intermingle its branches with its neighbor. We can, therefore, give only general instructions as to distances, leaving the planter to learn the habit of each variety that he plants, and thus arrange the most desirable distance for each, in order to give it space and yet waste no land.

Apples.—Standards for the orchard should be thirty to forty feet apart; half standards on free stalks, fifteen to twenty-five feet; pyramids on free stalks, ten to fifteen feet; on Doucain, eight to twelve feet; on Paradise, six to eight feet apart.

Pears.—Standards on free stalks, twenty to twenty-five feet apart; half standards, twelve to twenty feet apart; pyramids on free stalks, ten to fifteen feet; on quince stalks, eight to twelve feet apart.

LAYING OUT THE ORCHARD.

Presuming the land to be all prepared ready for setting, the first thing is to measure the distance apart of the rows at each end, and set the stakes; then, for large orchards, take a horse or mule that is accustomed to plowing singly, and with a light plow furrow the line, throwing the earth each way. This will open places for trees, so that very little digging will be required; and after the trees are planted, a harrow run crosswise will soon level the spaces. Next, procure a line long enough to reach across the entire plot; stretch it over the furrows, or where the first row is to be planted, then on that line tie tags of leather or cloth at such distances apart as you want to place the trees. Now procure small stalks; go along the line and stick down a small stake just under where every tag is tied to the line; then move the line to the next row, stake as before, and so continue until the plot is staked. The use of this line and stakes is just as desirable in small gardens or grounds, where the planting is to be done with the spade. It is more rapid and more correct than measuring for each tree with a pole or tape.

SETTING TREES.

Having the trees dug and pruned, and the ground prepared, the next thing is to plant the tree. The common practice is, to dig a hole, crowd the roots in, and if any are too long for the size of the hole, bend and press them down with the foot, then fill on some dirt and tread it down, and so keep filling and treading until the hole is filled. It is a wonder that so many trees live and struggle to become something, when planted in this manner; and it is no wonder that staking and repeatedly setting the tree upright fails at last in creating a well-shaped orchard. Having said that a tree may be transplanted safely at any time from the fall of the leaf until the reopening of the buds, we must add that, in this connection, the soil should always be in such condition that it will work easily and crumble up finely, in order that it may be well mingled among and around the roots. Haste should never be used in setting a tree; for one tree set carefully and correctly will produce more and better fruit—after-culture being the same—than four trees carelessly or hastily and incorrectly planted.

Depth.—The depth at which a tree should be planted must depend, first, upon its location, and whether in a soil naturally wet, or one quite dry, and upon the stalk on which the tree is worked. Standard pears and apples on their own roots should generally be placed about as they stood in the Nursery, or with about four inches of soil over their upper large roots. If planted in clay ground that is not thoroughly drained, they should be placed on the surface of the ground, and the roots covered by forming a mound over them. If they are to be planted in dry or well-drained ground, their position in the earth should be such that when the work is completed, the surface of the ground will remain level. The roots of fruit trees should always be invited to keep near the surface, say four or five inches below; and no hole should ever be dug or loosened underneath them at any greater depth than the surrounding soil has been plowed or spaded.

Pears worked on quince roots and apples on Paradise stocks should have the stock all buried underneath in the ground, as shown in Fig. 64. By this practice, the stock becomes entirely roots, because of its habit to throw out root; and the return of sap from the leaves being sometimes greatly checked by reduced size, and hence a partially broken connection with top and root, the sap is forced outward through the softened bark of the graft or tree at that point just under the ground, forming a callus, and frequently roots that ultimately places the tree on its own bottom. In preparing the place wherein to plant the tree, remove any poor or subsoil earth, and replace with good rich soil. Use no manure, but take the best surface soil for filling in. Make the center of the hole whereon the base of the main stem or root is to stand, a little crowning; then place the tree in position, and while one man sifts in, with the spade, fine top soil, another with one hand holds up the roots, and with the fingers of the other outstretched packs it thoroughly and finely over and around the lower roots; and, as the earth is filled in to his wants, passes around the tree, constantly packing the earth with his outstretched fingers; and as fast as the earth is filled to a root, so that it will lay horizontally, he lets it down and packs the earth around it, being all the time careful that no two roots cross or touch each other. When the earth is all filled on to the roots, and the surface left being level, if it is in the fall of the year, and clay ground, raise up a little mound around the stem, six to eight inches high, to throw the water off during winter; but early in spring take this mound entirely away, and leave the surface again level. In this way we have transplanted trees, thirty feet high, into bleak, windy locations, and never had occasion to use a stake or support of any kind. It matters not, however, how much or how well the earth is packed, if the lower roots are not first made firm. Fig. 65 shows the method we advise, and Fig. 66

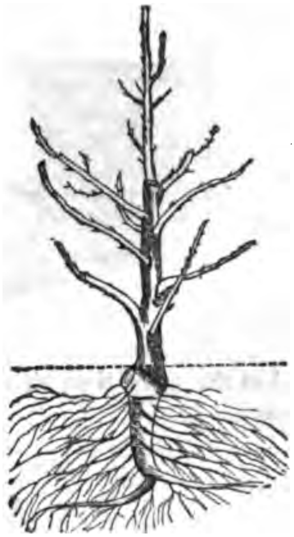

FIG. 64.

shows the common way of filling in and treading down with the foot; by which, it may be seen, the roots are thrown out of their true position,

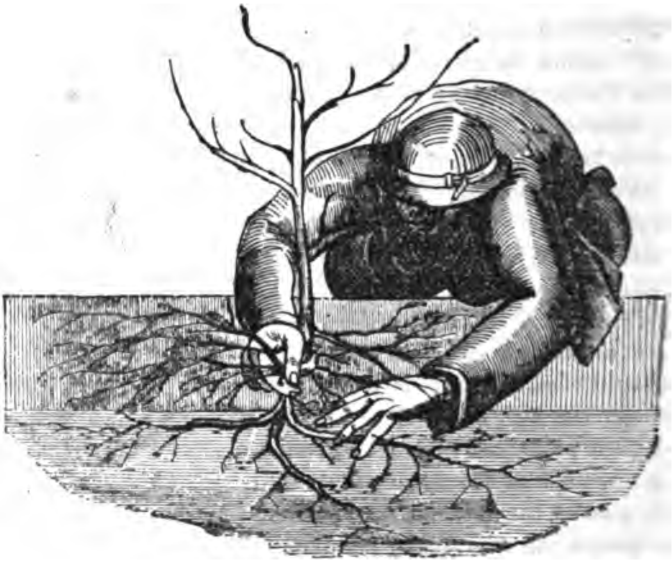

FIG. 65.

and at the same time air chambers are left in the soil to dry and destroy them.

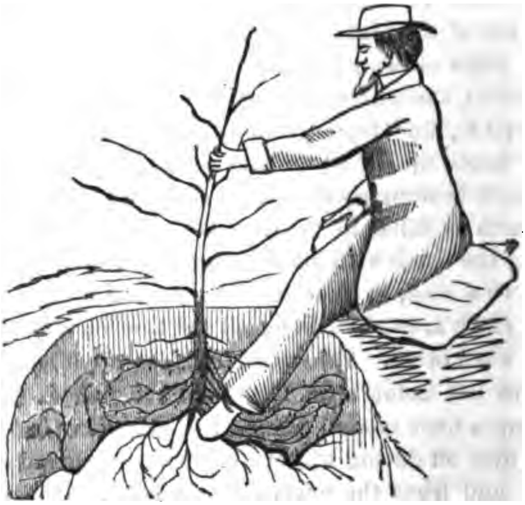

FIG. 66.

Summer Transplanting.—If necessary to move a tree in summer, or when it is in full leaf, select first a cloudy or misty day; dig a trench well out beyond the area of its branches, and work down below the roots, say two and a half to three feet; then commence to dig underneath, and as you proceed the earth will, much of it, fall off from the roots, when one person should hold them back while another digs. Having got the tree completely undermined, run underneath it a broad, strong board, and with one man to steady the tree, others may lift it by the board and set it, if large, upon a stone boat or sled, to be transported to its new position. The hole for its reception being prepared, of size at least one foot diameter greater than its roots, set the tree in place, and while being filled in, as we have above directed for planting trees, a third person should be constantly watering both roots and top from a fine rose or sprinkler. After the earth is all in, finish by a thorough saturation of the ground wherein it is planted, and some two or three feet beyond, covering all with a mulch of sawdust, tan bark, or other like material, three inches deep.

CARE AFTER PLANTING.

In our remarks upon the influence of culture, we have sufficiently pointed out the necessity of good careful cultivation of orchard trees. This cultivation must be regulated now by some words of caution. First. Never water the ground around the trees at any time for one year from the day of planting out. If they do not swell readily in spring, take a fine rose sprinkler, and just at sundown each night sprinkle the tops. If the ground becomes hard around the tree, loosen it with the hoe, an inch deep, and then cover it with three inches' deep of sawdust, tan bark, chip dirt, or any litter that will keep it from again drying, and prevent any great changes of temperature or moisture in the soil about the roots. This is called *mulching*, and should always be put around trees planted in the fall, to keep them from being acted upon by the frost heaving and cracking the earth.

If by any accident a tree has its bark rubbed off, or broken, trim it smooth with a sharp knife, but avoid rubbing any earth, or preparation of any kind, over it; left untouched, except the smooth trimming, it will soon heal over. When newly planted trees have to be in grass land, as is sometimes the case, when near the house, the earth should be kept mellow and light, a foot or more in diameter beyond the area of the branches; and to keep the appearance good, the mulch may be of new mown grass, renewed from week to week, or as fast as it becomes brown. In the autumn such trees should have a coat of well-rotted manure laid all over the mulched circle, and left to be dissolved and conveyed to the roots by the frosts and rains of winter.

Should a tree or trees exhibit any feebleness in growth, or its bark becomes mossy or rough, wash, or rather rub it well, with strong soap suds or weak ley water; this will not only give renewed action to the bark, but destroy any insects that may have fastened themselves to it. A weak solution of copperas water is also good for washing trees.

Of crops to be grown among trees, during their early years, or until they require the whole of the land, all grains and grasses are to be avoided, and potatoes, tomatoes, turnips, etc., adopted. A very good way is to cultivate the land during the early part of the season with horse and cultivator, and in August sow turnips. When the turnips are grown, pull and remove the bottoms of the best ones, and turn the poorer ones with their tops underneath, by using a light one-horse plow, and plowing only two to three inches deep.

Arrangement of the Plow for working among Trees.—The accompanying drawing (Fig. 67) shows a rod extending from the junction of the standard and beam of the plow toward the end of the beam; from the end of the beam, at right angles, a bar is carried out one foot to eighteen inches, where it connects with the rod from the standard. Attaching the horse at this point, it will be seen, enables the plow to be run nearer the trees without danger of the horse or whiffletree injuring them.

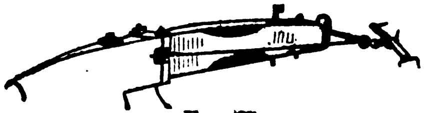

Fig. 67.

Top dress the land every fall, if it be not rich, with good well-rotted composted manure, or with bone-dust, or such other special manure as the land may demand. Plots of dwarf trees in the garden are easiest cared for by mulching the ground all over four inches deep, thus keeping down the weeds, and the land light, loose and uniform in temperature and moisture.

AFTER-TRAINING IN THE GARDEN.

It being the nurseryman's business to supply trees of shape and form desired by his customers, as to supply the variety of fruits, we must presume that our newly planted trees, being either pyramids or open dwarfs, are correctly formed; and if the reader will look over our previous instructions respecting pruning, he will soon be enabled, and with very little trouble, to continue to form his trees as they should be from year to year.

" As soon as the trees have made a growth of from four to six inches, they should be looked over, and when shoots are exhibiting too great vigor and rapid growth in places where they will not be wanted to keep the form hereafter desired, they should be pinched off just at the end of the last new formed bud; or if they are evidently not wanted at all, rub them off altogether. This will throw additional vigor into other branches, and oftentimes the branches pinched back, if slender and near the body of the tree, will form into eventual spurs or fruit bearing buds. The lateral branches, immediately below the leader or main stem, are always inclined to make the most vigorous growth; they must, therefore, be watched, and if promising to extend beyond the lower branches or rival the leader, they must be pinched back, and if they again start, must be again pinched back. In this pinching back, as well as all after pruning, study well the spaces on the tree, and so make the stop or cut at a bud, that when it grows again it will point toward the most vacant space near it on the tree, and at the same time not cross another branch. Should all the leading branches exhibit equal vigor, let them grow, and at the close of the season, just as the leaves are about to fall, or the following spring (we prefer the fall), cut them back one-third to one-half of their length, according as they are weak or vigorous, and making the cut so that the bud left next it be a full, plump bud, and pointed the way that, as it grows, will fill up spaces and keep the tree in a regular pyramid or open form, as may be desired. At this time also cut all small, weak and slender stems or twigs back to one, or at most, two buds; these, as before remarked, will often eventually become fruit spurs, it taking a young tree generally three or four years to develop them into bearing. This process of pruning is to be continued from year to year, or until the tree has acquired nearly the size it was designed, and covers the ground devoted to it. It will now also be well supplied with fruit and branches. After this period the object of the pruning will be to prevent the extension of the tree and maintain the fruit bearing parts in a healthy and productive state. Without proper care they will be liable to suffer from bearing too much, or from the growth of young wood on the extremities of young branches. To diminish the growth and favor the fruit branches, the young shoots must be pruned shorter than before, in order to turn the sap more to the benefit of the fruit; and when the fruit spurs become too numerous, so as to be too near one another and produce more fruit than the tree can sustain with safety, a portion of them must be pruned off. The lower parts always experience this difficulty first, the sap circulating more slowly there than in the summit. Fruit spurs of the pear and apple, if well managed, continue in a vigorcus bearing state for many years. To renew and prolong their vigor, the older plants must, from time to time, be cut away, and new productions created at their base to take their place."

AFTER TRAINING IN THE ORCHARD.

The training and pruning of standard apple and pear trees in the orchard is embraced in few words and simple practice, and yet more orchards of young trees are neglected than are correctly pruned. Too often the planter thinks he has nothing to do in the way of pruning until his trees begin to bear, and then he finds the tops so close and ill-shapen that if he again gets them into good form he will have to cut away from one-third to one-half of the whole top. Orchard trees should be looked over just as much as the pyramids or dwarfs in the garden, and their training continued as it has been begun, by keeping the branches regular and even, and preventing, from year to year, or we might say month to month, any crossing of their growths, too numerous center shoots, or long straggling branches off to one side. If this is done regularly, very little cutting with the knife will ever be required, for in orchard trees the main branches should never be stopped at the ends, except to keep them in shape. Cutting off the ends of branches has a tendency to create water or center shoots in standard trees, and thus increases the thick character of the head, which should always be kept open; that is, a tree should be so that sun and air can freely reach every leaf and fruit, and yet so that the direct rays of the sun can never shine over half an hour on any one point without some obstructing shadow from branch or leaf.

In pinching or cutting off a branch, cut (as we have directed in previous pages) close to the bud or stem, and not leave a stump that bark cannot grow over, and that may eventually create disease in the tree. If at planting the head of the tree was not formed, viz.: started with three or four good regular branches and a leader, it should be done early in spring or before the growth of the first season, by cutting clean away all the poorest, and leaving the best formed branches for its future head. Soon after it has started its growth in spring, go over the trees and rub off all shoots starting from the body, except three or four at regular distances above the branches already formed. These upper buds, so left, are to form the future branches along on its main stem. And from this time onward the principal training of orchard trees is to see that no branches cross each other, that no water or center shoots are permitted to grow, and to

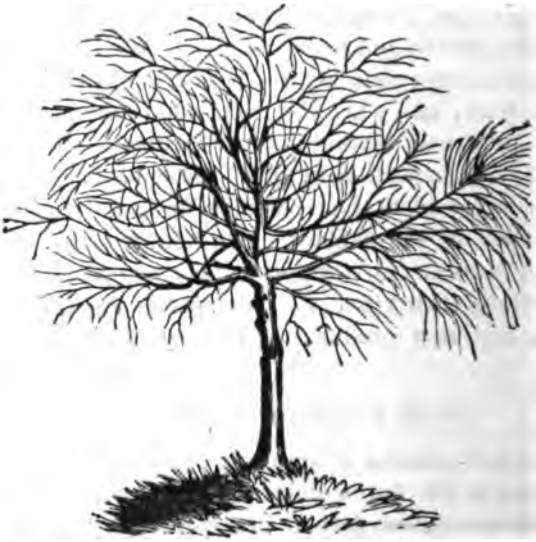

FIG. 68.

prevent any one branch from getting beyond the others, so as to destroy the balance or regularity of the tree. Some varieties of trees require very little labor to keep them in shape—others have to be gone over several times in a season. It is not a good thing to hasten their period of maturity by any process of pruning. Usually they will come into bearing in from six to twelve years; and if the first two or three years of bearing have the fruit pulled off when about the size of marbles, the trees will well repay it in growth and after production. Figure 68 shows a tree as too commonly managed, and Figure 69 a tree that has had reasonable care and attention.

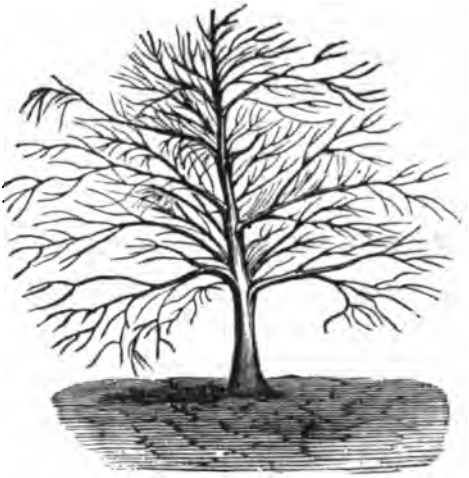

FIG. 69.

THE BEST TIME TO PRUNE.

He who has read of the structure and growth of the tree will understand the relation of roots and tops, the circulation of sap, etc., and hence understand why one season is preferable to another for pruning. Thus, if side branches are to be taken off, the period when there is a downward flow of prepared sap for formation of new wood, is the best, and this time is immediately after the terminal buds of the season have formed, or about midsummer. Wounds made at that time, if smooth and close to the stem, as we have directed, will soon heal over, but, if this cut be made early in Spring, or in the fall after the growth has ceased, it dries hard before another season's downward flow of sap, and the wood does not as readily form over it. If shoots are to be shortened, then whatever is to be done beyond whatever has been performed by the pinching in process, should be at a time when the circulation is least active, and the sap in the thickest condition, and that is from the fall of the leaf until about January. As soon as the period of growth again approaches, the sap circulates rapidly in warm days, and being then in a thin or crude state, it bleeds or flows readily from wounds made at the time. Branches, therefore, that are shortened in the fall will have the ends dried and hardened before the rise of sap in Spring, and hence the check to what is termed bleeding. If from location or other cause, it is necessary to prune early in Spring, the wound should be brushed over with gum shellac dissolved in alcohol to a thickness of thin paint. Some localities have more or less of the ends of twigs killed every winter, by extreme cold or sudden changes, acting upon the buds which at the end of a shoot are always the most abundantly supplied with sap. Such localities should have the pruning deferred until Spring, and then use the shellac.

INFLUENCE OF THE AGE OF THE TREE, ETC.

We have heretofore stated that with a tree a certain period of maturity must be reached before it will produce fruit; and we here add that there must be a certain period of maturity reached before the fruit will exhibit all its good qualities. This period is naturally reached sooner in some sorts than in others, and can be produced by different ways, but until it is reached no fruit of moderately good qualities should be condemned. Pears or apples grown side by side, on dwarf and on free stocks, present, at times, fruit very unlike, and this is generally attributable to the stock. But all the stock has of influence, is that by the absorption of descending sap when the pear is worked on the quince, etc., the buds are as perfectly matured, and as much food stored up to grow fruits at three to four years of age as they are on the free stock at eight to fifteen years.

In seedlings of the apple and pear the period of maturity is hastened, either by budding or grafting on the quince or paradise apple, or by engrafting on old trees that have arrived at bearing condition. In all cases the hastening of the period of production in the seedling is not because the tree on which it is placed is of bearing age, but because of the interruption of continuity in the bark, forming an obstacle to the descent of sap, and hence laying it up in the buds to be expended the following season in fruit.

CAUSES OF FRUITFULNESS.

In order to cause a tree or branch thereof to produce fruit, all that is necessary is to check, in some manner, the free circulation of its sap. This may be done by bending it over so that the top will be nearly on a horizontal line with the earth; or, it may be done by bending the branches downwards and fastening them in a bent position; or it may be done by fastening a wire or bandage tightly around the limbs or the body and thereby create an obstruction to the downward flow of sap, digging, in the month of early midsummer, down around and near to the body of the tree—say two feet therefrom, or more, according to the size—and cutting off its roots with a sharp spade, will also produce the same effect as above. This is called root pruning. Frequent transplanting the tree, and many other ways are practiced to induce trees to bear that heretofore have been barren; all, however, resulting in the same cause, that is in creating a larger store of material in the bud than would have been were there no obstruction to free returns of the sap to an expenditure by the roots, and, therefore, a nucleus for the formation of fruit. Two years are required to reach the results of any of these processes, except where fruit buds are already formed; and then the result is, to increase the size, beauty and quality of the fruit. Such experiments show us to what perfection varieties of fruit may be brought by complete cultivation and supply of suitable food in the soil. Three things are requisite to produce perfect fruit: *first*, mature age of the tree, either artificial or natural; *second*, two good seasons, one for the storing up and forming food in the bud, and the other for its development; and, *third*, a cultivated and suitably enriched soil.

Many trees bear fruit only every other year. The general reason of failure to produce fruit annually, is, that the demand on the tree for food to grow the fruit was such as to exhaust it of all the roots could supply, or the leaves elaborate, and, therefore, no new fruit buds could be formed. Had a portion of the fruit been taken off when about as large as hickory nuts, and an increased supply of food been given the roots, fruit buds would have been formed, and, the next season, exhibited in the growth of fruit. Attention to the rules we have given for pruning, thinning out of fruit, and supplying the tree with food, will, almost universally, be rewarded with crops of fruit annually, except the buds may be destroyed by excessive cold in Winter, or by frosts in Spring when the flowers are opening and the fruit setting.

APPENDIX.

TWELFTH REPORT

OF THE

OHIO POMOLOGICAL SOCIETY.

Proceedings of the Annual Meeting of the Society, held at Painesville, December 13, 14, 15, 1865.

The annual meeting of the Society was held at Painesville, according to appointment, commencing on Tuesday morning, Dec. 13th, and closing on Thursday evening, the 15th.

The necessary preparations had been made by the Secretary and citizens of that place, and Wilcox Hall presented a fine display of apples by the time the members from a distance began to arrive. Owing to a severely cold storm, the attendance of members from a distance was not very large; but there was a good number present from northern Ohio, and a few from other sections, also several visitors from western New York and Pennsylvania, and from Indiana and Illinois.

The show of fruits, especially apples, was remarkably fine, as was to be expected in that paradise of apple growers. There were also exhibited a few lots of grapes in good condition, and a very fine display of winter pears, embracing thirty-five varieties, from Ellwanger & Barry, of Rochester, N. Y.

The meeting was called to order at 11 o'clock A. M., Dr. Warder in the chair, and M. B. Bateham, Secretary. After an hour spent in enrolling names of members, arranging fruits, &c., adjourned till 2 o'clock.

AFTERNOON.

The President appointed the following committees:

1. ***On Reception and Introduction of Delegates, Visitors, and New Members*—J. Storrs, J. Harrison, W. F. Greer.**
2. ***On Business and Resolutions*—G. W. Campbell, S. B. Marshall, M. B. Bateham.**

3. *On Amendments to Constitution*—Jno. B. Miller, G. W. Campbell, J. A. Warder.

4. *On Fruits Exhibited*—J. R. Swan, S. B. Marshall, G. Boalt.

5. *On Nominations*—J. Storrs, A. M. Maddocks, F. R. Elliott.

The reports of the Secretary and Treasurer were read and accepted.

The report of *ad interim* committee was given verbally by Dr. Warder, President, and M. B. Bateham, Secretary, embracing many interesting details in regard to the varieties and culture of strawberries and other summer fruits. [See a few pages onward].

In the evening, according to announcement, an address of welcome was delivered by Dr. Beardslee, of Painesville, followed by the annual address of President Warder.

DR. BEARDSLEE'S ADDRESS.

Mr. President and Members of the Society:

In behalf of the members of this Society who are residents of this village, and of those who, though not members, are interested in the cultivation of fruit, and the ornamental as well as useful branches of horticulture, I wish to welcome you to our village, and to tender you, during your stay, the hospitalities of its inhabitants. Our village has been commended for its neatness and taste, for the beauty of its scenery and the abundance and excellence of its fruits, by some whose opinions are not without value —but I shall leave you to judge in these respects by your own personal observations. There is one particular in regard to which I wish to be indulged in a few brief remarks. The south shore of Lake Erie is regarded as peculiarly adapted to fruit cultivation, by both soil and climate; and as many of the gentlemen present are from other and distant parts of this State, and some from other States, I purpose to speak of these peculiar advantages.

And first, of *Climate*. Large bodies of water are well known modifiers of climate. In winter large quantities of ice are formed in Lake Erie, which tends to make the advent of spring gradual, and to prevent those sudden developments of fruit buds, which render fruits liable to injury by spring frosts. Of course, in any temperate climate a degree of cold sufficient to destroy the buds of the more delicate trees, is liable to occur; and this is more frequently the case where the range of variation in temperature is not only great, but sudden, as was the case in the very severe storm of January, 1864, which destroyed all the peaches and all the cherries of our village and vicinity. In my residence of nearly twenty years in Ohio, I recollect two seasons only in which the delicate fruits, after escaping injury during the winter, have been destroyed extensively by frosts in the spring. Somewhere between the 15th and 20th of May, 1845, peaches and cherries were almost totally destroyed, and apples much injured. The spring had opened early, and all the fruits were unusually advanced in growth. The other occasion was June 5th, 1859, when a frost of unexampled severity, and of three days' duration, extended from beyond the Mississippi to the sea coast of New England—diminishing in intensity, however, as it progressed eastward—and everywhere destroying or injuring severely fruit and corn, and even wheat and rye. Apples as large as nutmegs, peaches nearly as large, and cherries half grown, were frozen through and became black in the morning sun. Grape vines which had made several feet of new wood, and were in flower, were killed in many localities back to the old wood. Pear trees had their young wood killed, and many of them died subsequently from the injury. Indeed, the new growth upon many of the native forest trees was killed. The weather in autumn is peculiarly fine. The waters of the Lake, thoroughly warmed in the summer, part gradually with their heat, making our autumnal months mild and genial, and almost always preventing early frosts. This weather conduces not only to the more perfect ripening of the later varieties of fruit, as grapes and apples, but also to the full maturity of both the wood and fruit buds of the trees and vines. Catawba grapes, for instance, have remained on my vines quite uninjured till the 20th day of November.

With this climate we have a great diversity of soil. The ridges, of which from one to three run in a direction parallel to the shore of the Lake, afford a soil of sand or gravel—or sandy or gravelly loam—light, dry and porous, still of reasonable fertility, easily penetrated by the most delicate roots of trees, needing no underdraining, as it rests everywhere upon a gravelly substratum, and needing no trenching or subsoiling. Besides the soil of these ridges, we have clay gravels, clay loams, and clay soils, varying almost infinitely in regard to their tenacity, and also the deep muck, which prevails between these ridges and the Lake. We have, too, soil overlying a rock formation of limestone, as well as that lying, like that of this village, upon sandstone. In some of these varieties of soil, all fruits, capable of being grown in this climate, may be advantageously raised. Cherries and peaches are nowhere more at home, or more excellent, than on our sand and gravel. Cherries are especially fine, and our friend Dr. Kirtland, at his home thirty miles west of us, has originated some of the finest varieties of Cherries known to Pomologists.

Grapes succeed well on this sand and gravel—making fine growth of wood and an abundant yield of fruit—though the opinion is now entertained that a soil of more tenacity—for instance, a gravelly clay, if properly prepared and loosened, produces fruit of a richer quality. Pears are not a success on the lighter soils, but soils well adapted to them may easily be selected. Some varieties of Plums succeed finely; and of the finer varieties of the Apple, some succeed best on the lighter and warmer soils, some better on the clay, and some equally well on both.

This, gentlemen, is a general outline of the climate and soil of this region, to which I bid you welcome.

The Annual Address by the President, though somewhat lengthy, was listened to with marked attention by the large number of citizens and members present. That portion of the address relating to Industrial Education was referred to a special committee whose report on the subject, as well as the entire address, will be found in subsequent pages of this report.

DISCUSSION ON SMALL FRUITS.

STRAWBERRIES.

Dr. Kirtland, by request stated that he had formerly given considerable attention to Strawberries, but had not grown many varieties for a few years past; preferred Hovey's Seedling to all others on his land; has prejudice against Wilson's Albany.

Mr. Bateham had noticed that Hovey's Seedling was usually very fine in appearance in the Cleveland market; he thought it was better adapted for sandy than clayey soils. With many years trial he found it worthless on the clayey soils at Columbus. He had noticed, too, that on sandy lands in moist weather this fruit, though of fine appearance was sadly deficient in flavor—worse than Wilson's Albany in this respect—and in productiveness the Wilson was vastly superior. One of the largest strawberry growers at Cleveland told him the past summer he would rather grow the Wilson for ten cents a quart than Hovey, or any other variety he had tried, at twenty. The Austin or Shaker was grown to some extent around Cleveland, but was not approved—fruit coarse and spongy, and color bad for market. He expressed surprise that the Cincinnati varieties, as Longworth's Prolific and McAvoy's Superior, had not become more generally popular.

Dr. Warder, in reply, gave a brief history of these varieties, and expressed preference for them over most others, especially for their superiority of flavor, though he admitted that Wilson was largely supplanting them in the Cincinnati market, as elsewhere, owing to its productiveness alone.

Mr. Campbell and Mr. Powers spoke very favorably of McAvoy's Superior and Longworth's Prolific.

Russell's Prolific being inquired about, Mr. Campbell said he had grown it at Delaware, on strong soil, and had seen it at Pittsburgh and elsewhere; thought highly of it as a large, vigorous hardy and productive variety.

Mr. Bateham had observed it for two or three years past; at Rochester, Columbus and Pittsburgh was favorably impressed with it; had doubts as to its fitness for transporting to distant markets—the berries too tender for such carriage. He thought it was destined to become very popular.

Dr. Warder asked if it was not identical with the Buffalo Seedling.

Mr. Bronson, of Geneva, N. Y., said the general testimony seemed to be that the two were not identical but very similar. He thought the Russell was not quite as well adapted for sandy as for strong soils.

Mr. Beeler said he had seen it doing very well on sandy lands in New Jersey; also on strong soil at Pittsburgh.

Triomph de Gand.—Dr. Warder said he was prejudiced against this variety; he was not partial to its flavor, and it was very deficient in productiveness with ordinary cultivation.

Several others spoke of it as having been too highly praised—though it was admitted that Mr. Knox, of Pittsburgh, and some others, with favorable soil and high cultivation, succeeded admirably with it, as they did also with several other foreign sorts.

Mr. Bateham expressed the belief that Mr. Knox did not now rank the Triomph de Gand quite as high, in comparison with several others as formerly. The variety called by Mr. Knox "700," and very highly esteemed by him, is evidently a foreign variety of which the name has been lost. Mr. Bateham was of the opinion it would prove to be the *Jucunda*, imported some years ago by Mr. Saul, of Washington.

Dr. Ensign, of Madison, had grown the Triomph several years with pretty fair success, but found the Wilson and several other varieties more profitable. He was planting the Russell and the *Tribune* varieties, hoping to find them superior to any other sorts.

Trollope's Victoria.—Mr. Miller, of Springfield, spoke highly of this as a late variety, for amateurs; fine size, color and flavor.

Dr. Warder also liked it—better than Triomph de Gand.

Mr. Maxwell said it was not sufficiently productive or reliable for profit though fine for amateurs.

Fillmore.—Mr. Bateham spoke of this as one of the most productive and beautiful on Mr. Knox's grounds, though not regarded as of the finest flavor; he thought it one of the best market varieties and deserving more attention than it had received; he had also seen it very fine at Cleveland.

Golden Seeded.—Mr. Campbell said this was one of Mr. Knox's favorite early varieties, and was but little known generally though not new, he would recommend it for trial.

Austin or *Shaker* was condemned as coarse and of bad color for market, as well as poor flavor.

Jenny Lind.—Mr. Beeler regarded this as the largest and best early variety. He referred to Mr. Purdy, of South Bend, Ind., who grows hundreds of bushels of it for the Chicago market, and preferred it to all other varieties. His soil is sandy. (See letter from him on a subsequent page.)

Mr. Bateham had grown it for a number of years in the Columbus Nursery, on strong soil; thought well of it, but was not sure it was sufficiently productive for profitable market culture.

Burr's New Pine.—Dr. Warder and several others spoke of this as the finest of all strawberries for flavor, and regretted that it was not more hardy and vigorous in growth.

Mr. Bateham said he had much regard for it on account of its merits, as well as for having assisted in its introduction to the public nearly twenty years ago. He was sorry to find so many persons cultivating a spurious variety, probably the *Scioto*, in place of the genuine New Pine. This was the case with Mr. Knox, and more than half the nurserymen and amateurs he had met with in the past few years; in fact he did not know where genuine plants could be obtained at this time, unless from Mr. Campbell, of Delaware.

RASPBERRIES.

American Black, or Doolittle's Improved Black Cap.—Mr. Fahnestock, of Toledo, found it a valuable fruit—productive and profitable. Concurred in by Mr. Storrs, of Painesville, and by several others, though exceptions were made on account of its poor quality. The "Yellow Cap" variety Mr. Miller thought unworthy of cultivation.

Kirtland.—Mr. Nicholson, of Rockport, said he thought it the best red raspberry for home use—too tender to carry to market. The American Red (native) is similar, but later.

Allen—(another of the same class).—Mr. Fahnestock found it of no value—should be rooted out.

Mr. Bateham had found it quite worthless at Columbus, and withal quite difficult to root out—the roots spreading like Canada thistles.

Mr. Cowdery, of Sandusky, had found it not very prolific, but valuable when planted alongside of another variety, which seemed to assist in impregnating the blossoms. Mr. Miller concurred.

Mr. Maxwell had tried the Allen several years, and found it unworthy of cultivation.

Philadelphia.—Dr. Warder spoke of this as a hardy variety of the American Red—good and productive in favorable soil; much grown around Philadelphia.

Purple Cane.—Dr. Warder recommended this as a hardy and desirable variety for family use; the fruit rich and of delicious quality, too tender for market. Mr. Miller concurred.

Brinkle's Orange.—Mr. Miller found it usually tender, but last spring he had some plants on the north side of a board fence that had endured the severe winter uninjured. Mr. Bronson, of Geneva, N. Y., regards it as the best family raspberry, though the plants require some protection in winter.

Hornet.—Mr. Maxwell had fruited it, found it large and handsome, but not first-rate flavor. Berries rather firmer than Brinkle's Orange.

Catawissa.—Mr. Fahnestock thought it the best of all the autumnal varieties. Mr. Campbell finds it too soft. Dr. Warder said the fruit crumbles in picking.

Belle de Fontenay.—Mr. Bronson said it bears well if the season be not too dry; it suckers badly.

Mr. Bateham had found it of no value at Columbus; climate too hot and dry for it; had seen it bearing plentifully at Rochester, on deep, moist soil. He did not regard any of the autumnal varieties of any real value; and in regard to the whole list of raspberries, there is much room for improvement. We yet need a first-rate variety that is hardy, productive, and firm enough for market.

DISCUSSION ON GRAPES.

[This discussion was in part held at the Grape and Wine Show, gotten up by Mr. Elliott, at Cleveland, Sept. 28 and 30, 1864, when the committee ad interim of the Pomological Society were present. A report of that discussion was read by the Secretary at the annual meeting, and then enlarged and revised by the Society, as follows:—SEC'Y.]

At the suggestion of the Secretary, the newer varieties of Grapes were first taken up, beginning with those of Ohio origin.

Mottled.—A seedling by Mr. Chas. Carpenter, of Kelley's Island, now pretty extensively known, and has been several times mentioned in the reports of the Society. Mr. Carpenter said it begins to ripen about as early as the Delaware, but is a longer time before quite ripe; he does not think it as valuable for the table as for wine; has found it quite superior for this purpose; the must weighing 100 and over. Several of the wine-makers of Cincinnati had spoken very highly of it.

Mr. Campbell, of Delaware, had fruited this variety several years; finds it improves in size of bunch and berry; ripens at the same time as Diana; believes it may prove a valuable grape, especially for wine. The vines are as hardy as the Catawba; fruit a little too pulpy for a table grape.

Dr. Dake, of Columbiana county, spoke highly of the Mottled wine; thought it superior to Catawba. Mr. Elliott and Mr. Campbell concurred.

Charlotte.—Another product of Kelley's Island; originated on the farm of Mr. E. Ward; resembles the Diana, but bunch and berry larger, and ripens a little earlier—not yet fully tested, but promises well. Mr. Elliott said the flavor was superior to Diana, and equal to the Iona.

Lydia.—A chance seedling on the ground of Mr. A. Kelley, of the Island; color light green, with amber tinge in the sun. Mr. Carpenter said it ripens with the Catawba, but was good earlier—a fair bearer, but not abundant. Mr. Campbell finds it very good; it resembles the Rebecca, but has a tougher skin; bunches small, but berries large; vines hardy; not very productive with him. Mr. McIntosh, of Cleveland, said in Mr. Case's grounds it grows strongly and produces well; thinks it the most promising of the native white grapes. Mr. Elliott said it was the best white grape, in flavor, at the Cleveland show; better even than the hot-house grapes. Mr. Ward had told him that it improved in productiveness as it advanced in age.

Mr. Ensign found the plant perfectly hardy, but he could not rank the fruit as highly as some others had done; thinks it not equal to Allen's Hybrid. Mr. Campbell concurred.

Hattie.—Mr. Elliott presented the following description of a new grape by this name: 'Bunch medium, four to four and a half inches in length, not shouldered, rather loose; berries round, slightly oval, medium size, say as large again as Delaware, or three-fourths the size of Catawba—uniform in size on the bunch; skin thick as Catawba; color, bright clear red, translucent in the sun, with a fine white bloom; peduncles and foot stalks long, rendering the cluster somewhat loose; flesh light pale red, apparently when cut in half; when pressed out from the skin, the flesh is a clear white, with little pulp—pleasantly vinous, but lacking sugar. Ripens with Concord. A beautiful grape; raised from seed of the "Michigan," by Mr. N. R. Haskell, of Monroe, Michigan. Fruited for the first time in 1861. Foliage similar to Catawba, but not as large, of a peculiar yellowish green; wood light pale brown.

The "Michigan" referred to above, Mr. Elliott said he had come to the conclusion was *Catawba.*

Cuyahoga.—Remarks on this grape, by Mr. Elliott and others, were of the same import as last year, to-wit: That it is too late in ripening for the climate of Ohio, except possibly around Cincinnati; but in a warmer latitude it would probably be found very good.

Anna.—Mr. Carpenter said he had tried this grape a long time, but could not ripen it. Mr. Barney, of Sandusky, said it had ripened with him but was a poor bearer. Mr. McIntosh thought it was as late as the Cuyahoga, and no use for this climate. Mr. Bateham said it was too late for Columbus. Dr. Whipple said it ripened at Cincinnati, but was a shy bearer.

Allen's Hybrid.—Mr. Carpenter has fruited it for four or five years, and likes it well; thinks it the earliest of the white grapes, but the foliage is rather tender and liable to mildew; resembles foreign varieties. Mr. Campbell also spoke quite favorably of it; said although the leaf was somewhat liable to mildew, the fruit was generally good; and the wood seemed quite hard; had seen it uninjured by the cold of last winter, where the Isabella and Catawba were nearly killed. Mr. Ensign had fruited it four years; he finds it a good grower; bunch large and berry fine; vines hardy, but somewhat liable to mildew. Mr. Dean, of Portage county, had a few vines—all killed by the winter. Mr. Harrison, of Painesville, lost some one year old vines by same cause. Mr. Miller had some two years old killed, while some three years old were uninjured.

Rebecca.—Mr. Bateham said this was better known than any other American white grape, and was quite popular with amateurs in most parts of the country, though not a very reliable or productive variety. Mr. Carpenter regards it as a desirable grape for the table; it bears well with him; sometimes loses its foliage before the fruit is fully ripe, but seldom mildews; ripens with the Isabella. Mr. Campbell had not found it bear very well, but likes the fruit; leaves on young vines liable to mildew. Mr. Barney has never got a fair crop of it; leaves fall too soon.

Iona.—This new grape, which has excited so much interest at exhibitions, and been so highly commended in the newspapers of late, was exhibited at Cleveland by Mr. Bushnell, an agent of Dr. Grant, who distributed to visitors catalogues giving full history and description. Mr. B. said he had seen the Iona bearing four years; had never known it injured by mildew or rot, while Isabella, Rebecca, and Catawba, on the same grounds had suffered badly from these maladies. The fruit hangs well on the vine and bunch, and keeps well after being gathered—has not been tested for wine. The wood is short-jointed and heavy; buds start late in the spring; very productive; ripens same time as the Delaware, or within two or three days of it; vines perfectly hardy and very productive. Mr. Campbell had vines of it growing the past two seasons; not fruited yet; foliage and growth healthy, more like Diana than Catawba; wood short-jointed; fruit finer than Diana; very promising. Mr. Beeler, of Indianapolis, had seen the Iona in bearing at the residence of Charles Downing, Newburgh, N. Y.; was much pleased with its appearance; vines thrifty and productive; fruit ripe 10th September, a little later than Delaware. Mr. McIntosh and others had the vines growing, and spoke favorably of their vigor and hardiness. Mr. Bateham said he had seen better specimens of the Iona fruit exhibited at Rochester than those shown here by Mr. Bushnell; he regarded it as the most promising of all the new grapes, though for quality or flavor alone he could not say he thought it equal to the Delaware.

Israella.—This also was exhibited by Mr. Bushnell from Dr. Grant, but did not excite so much interest as the Iona, and very little was known about it by persons present. Some uncertainty was felt in regard to the hardiness of the vines, both of this and the Adirondac, and the general impression seemed to be, that they had not yet been sufficiently tested.

Mr. Bushnell said the Iona had now borne fruit for seven years, and Dr. Grant had taken great pains to have it tested in a variety of locations before recommending it to the public. Mr. Griffith, of North East, Penn., said he thought we had not sufficient evidence as yet on which to base any positive opinion as to these new grapes; he was disposed to try them for himself. He hoped that in discussing the merits of new fruits, we should not be obliged to discuss also the men who introduce them to the public.

Dr. Dake, of Salem, Ohio, expressed himself well pleased with the course Dr. Grant had pursued in reference to the Iona, but thought more time was needed for judging of the merits of the Adirondac.

Adirondac.—Specimens of this new variety were exhibited, from Mr. Bailey, of Plattsburg, and all present seemed favorably impressed by its appearance and the accounts they had seen of it.

Mr. McIntosh said the specimens exhibited were much injured by over-ripeness, and having been packed in a musty box. He spoke of the very high opinion he had formed of this variety from seeing it two years ago, when at Mr. Bailey's grounds, and saw the original vine at Port Henry, on Lake Champlain, (lat. 44 deg). From its northern origin, as well as from the appearance of the leaf and wood, he had confidence that the vine would prove sufficiently hardy for most parts of our country, though he confessed there had not been sufficient trial as yet to establish its character in this respect, nor as to its liability to mildew. Its growth is quite strong, resembling the Isabella, the fruit black, berries large and round, bunches more compact than Isabella, finer flavor, and ripening full two weeks earlier, or a week before the Delaware.

Mr. Campbell said he was much pleased with this fruit; tasted better specimens at Rochester; not unlike the Isabella; but fears it will not prove quite hardy enough for northern winters. Young vines were a good deal injured with him last winter, even where covered with earth. He had not heard of its being grown without winter protection in New York. He believed Mr. Bailey covered all his vines—Delaware and Isabella, as well as Adirondac.

Mr. Carpenter hoped that this and the other new varieties would prove all that could be desired of them; but the people had so often been deceived by the high recommendations bestowed on new fruits before they have been sufficiently tested in the various parts of our country, that he hoped we should exercise caution, and not pronounce opinions too hastily, so as to mislead the public, who look to us for instruction.

Delaware.—Mr. Dean, of Portage county, said he visited a small vineyard recently on sandy soil, where Delaware vines had cast all their leaves and the fruit was green and worthless. Mr. Elliott had seen several cases of the same kind, on sandy land; he thought strong loam or even clayey soil best for this variety and for grapes generally.

Mr. Griffith, of North East, Pa., said he had given very much attention to this matter of soils and locations for vineyards, especially along the south shore of Lake Erie; had visited grape gardens in fifteen or twenty localities from the New York line to Kelley's Island, the present summer, and had uniformly found the Delaware vines healthy and productive, both on sandy and clayey soils. He believed the cases of failure alluded to were in consequence of a lack of drainage, the roots of the vines being in cold springy subsoil.

Mr. Elliott said he had seen cases of the Delaware casting its foliage where the vines had been heavily dressed with slaughter house offal and other strong manures.

Mr. McIntosh said the Delaware was doing very finely on deep sandy soil, in gardens on Euclid street, Cleveland. Mr. Bateham and Dr. Beardslee reported the same as to Painesville. Dr. Whipple said the Delaware was very reliable on the strong clayey soils around Cincinnati; the fruit was very little effected by the rot while the Catawba was an entire failure.

Col. Harris spoke of the freaks of the Delaware and other vines at Mr. Carpenters, where land was manured; also at the east he visited a place where the man had tried the Delaware and condemned it—the soil was a poor sand with cold springy subsoil beneath.

Diana.—Mr. Bateham said he believed this grape was growing in favor in Ohio as well as in New York; he had formerly thought it a very unreliable sort, for this climate, at least. Mr. McIntosh said the fruit improves as the vines gain age. Its time of ripening he thought was with the Catawba. Mr. Elliott thought the fruit very fine when ripe, but had seldom seen it well ripened around Cleveland; as late as the Catawba. Mr. Campbell had found it very late and inferior on rich loamy soil, but good on poorer and dry soil. Mr. Griffith coincided with Mr. Campbell—would plant Diana on poorest soil. Mr. Carpenter had a lot of Diana vines on deep, rich soil, well drained, of little worth; others on poor soil good. Isabellas and Catawbas on the rich soil also a failure. He was sorry to see Mr. Meade and others recommend black muck as manure for grape vines—it would be ruinous on the Island.

Mr. Elliott said the best Dianas he had seen were growing on vines which had been allowed to climb on high trees; and he thought it might be better to allow this variety larger space than usual. Mr. Carpenter said the wood was comparatively long-jointed, and hence should be allowed more length of wood in pruning than the short-jointed kinds.

Mr. Brayton and Mr. Storrs of Painesville had found the Diana ripen earlier than Catawba. Mr. Ensign considers it as early as Isabella. Col. Harris spoke of the excellence of the Diana at Mr. Knox's, near Pittsburgh. Dr. Warder said it was an excellent variety to keep—was sorry none were present at this annual meeting.

Catawba.—Discussion on this variety did not elicit much that was new. The crop of this fruit on Kelley's Island was reported as very fine, though not a full one in quantity, owing to injury to the vines last winter. The same was generally reported of the vineyards around Cleveland, and other parts of northern Ohio, only the ripening was less perfect than on the Island; and the fruit did not keep as well into the winter as heretofore.

Hartford Prolific.—Mr. Elliott and some others spoke unfavorably of this variety, owing to its habit of dropping its fruit in many cases, soon as ripe, and also the lack of excellence in quality. Mr. Bateham and others said that on good soils the fruit hung on well, and although the quality was not first rate, it was quite good, and so early and productive as to render it popular and profitable, especially as a market variety.

Creveling.—Mr. Bateham disliked this variety on account of the small size of the berries and straggling shape of its bunches. Mr. Carpenter likes it for earliness and good quality, bears better than the Logan, and quite hardy. Mr. Campbell would plant a vine or two of it in a collection of 10 or 12 kinds; ripens after Hartford.

Union Village (and *Ontario.*)—Mr. Bateham stated that the American Pomological Society had decided that the Ontario was identical with Union Village, and hence the former name should be dropped from the catalogues. He also observed that it was highly commended by some as an *early* variety, but in his experience it was not very early nor otherwise very desirable, the vine was too rampant, and not hardy. Mr. Harrison of Painesville and Mr. Barney of Sandusky, also spoke of it as liable to injury by the winter. Mr. Campbell said with him the fruit ripened with the Isabella, and he regarded it as deserving a place for its fine size and appearance and fair quality.

Ives' Seedling (of Cincinnati.)—Dr. Whipple said this variety was growing in favor as a wine grape in his vicinity; it makes wine very much like that of Norton's Virginia, and is likely to take the place of Catawba, where the latter fails. The vine is very hardy, and the leaf downy on under side like those of the Fox tribe.

Mr. Brayton, of Painesville, said that Mr. Raymond, of Toledo, was cultivating Ives' Seedling with success and approbation. Mr. Barney, of Sandusky, has it also under trial. Ives' Madeira and Kittridge are other names for the same grape.

Rejected Varieties.—Referring to the large number of worthless varieties of grapes enumerated in catalogues, and numerous specimens of such on the tables present at the Cleveland show, the following among them were named as unworthy of cultivation, especially now that so many better kinds can be had adapted for all locations:

Charter Oak, and its kindred of the *Foxy tribe*, as Northern Muscadine, Perkins, Orfur's Raisin, &c. Also a lot of inferior seedlings of the Isabella tribe, as Garrigues, Logan, Louisa, Franklin, Mary Ann, &c. Taylor's Bullit was also condemned, at least for the climate of Ohio. Ontario was dropped from the lists as being identical with Union Village.

The following remarks on grapes are by Mr. Elliott:

Concord.—Mr. Elliott said an error occurred in last year's report relative to his remarks respecting this grape. He was reported as coinciding in the general recommendation of the variety for farmers and others to cultivate, when in truth he had never yet favored the variety. Whatever it might do in Missouri or with Mr. Knox at Pittsburg, around Cleveland or wherever he had met it, and he had frequently seen and eaten of it in localities many miles distant from each other, it required a quality that he had never yet discovered to enable him to praise it in the manner that has been done. He does not regard it as any more hardy or any more free from mildew than a variety now generally grown around Cleveland and some other points, as the Isabella, but which Mr. E. claimed was not the Isabella but a distinct sort, and for want of a better name he called it Aiken, because that was the name of the man in whose possession was the vine from which the variety now so generally grown was propagated.

Mr. E. said that when commencing nursery business at Cleveland, now some twenty years since, his attention was called to this vine. It, the original, in possession of Rev. Doctor Aiken, stood in a warm sheltered location growing in a gravelly sandy loam, and its period of early maturity and round form of berries with close compact bunch, he had attributed to this cause, and for many years regarded it only as Isabella, that he in common with other nurserymen about Cleveland at the time propagated and sold from this vine as Isabella. Hence its general distribution. That in 1842 Dotus Kelley made cuttings from the vine in Mr. Aikin's grounds and at the same time made cuttings from a vine at Gov. Reuben Woods, in Rockport, and from one at Heman Ely's, in Elyria, took said cuttings and planted them on Kelly Island. The following year they were planted out as vineyard on that island, said vineyard being now the property of Geo. C. Huntington, Esq. That an examination of that vineyard, now some three years since, satisfied him of the character of the varieties of vines in it, and he advised all who had any doubt in the matter to visit Mr. Huntington at the time of ripening of grapes and examine for themselves. They would find the grape now by Mr. E. called Aiken, there growing side by side and with the same cultivation as the oval and loose bunch or true Isabella. They would find no mildew on the Aiken, but would find it on the true Isabella. They would find another sort, viz: the Alexander there growing, but most of them Mr. Huntington had rooted out. This latter variety, with his knowledge of Mr. Ely's intention to make wine and the authority then in vogue, viz.: Adlum, he had no doubt was from the cuttings taken from Mr. Ely's and was the Alexander. He stated also that Mr. Huntington once told him (Mr. E.) that seeing the superiority of this close-bunched and round-berried sort, they had for many years propagated only from it. Hence another cause for its pretty general dissemination through northern Ohio. as it is well known that Kelley Island sells yearly thousands of grape vines.

Mr. Elliott said, to come back to the Concord, that he could see no superiority, in fact no equality, between that and the so called Aiken, and that he looked upon the Concord, Hartford Prolific, Crevelling, Logan, and all that class of grapes as having now their great day—that ten years hence, with the same progress we have made, or indeed with dissemination of variety already existing, no man would think of planting such varieties as Concord, &c., &c.

GRAPE CULTURE.

PRUNING, TRAINING, ETC.

Mr. Elliott asked for information respecting modes of training; he knew somewhat of modes; had read all or nearly all that had been written on the subject for hundreds of years, and now believed that in so far as regards our native grapes, we really had much yet to learn. All writers have carried out old stereotyped impressions with slight variations, and so far as the practice of Drs. Grant, Knox, Fuller, etc. etc., as laid down by them, he had no faith in it as suited to our vineyard wants; at any rate he did not at all believe in them on our lake shore with the liability that we have to gales of wind. He would like to know who had practiced any of these *paper* drawn plans and found them successful; he had no doubt of their success where a daily examination could be made of them by an experienced eye, but as vineyard practice they would not do. Had any one tried the new form as practiced in some vineyards in California?

The time to prune was another matter as well as the manner. Our early teachings here were to prune in February, but in later years many have come to prune in the fall. He had advised fall pruning some years since to a friend of his whose vines were pruned by a German of more than ordinary knowledge and practice, but the German scouted his advice, yet did (as the owner desired) prune one vine, and now all his pruning was done as soon after the fruit was gathered as he could get at the work.

Recently he had read advice toward pruning in the spring after the buds have swelled almost to bursting, or even grown to the size of mouse ear leaves; and Mr. Spalding had told him of a vine that bore yearly fine fruit, and that was pruned only after the buds were largely swollen or burst. Were it not that nurserymen desire to make up their cuttings in winter, etc., he thought perhaps cuttings made late in spring would be more certain to grow. All knew how readily currants or gooseberries grow when stuck down at the time they are just bursting their buds; and in propagating quince stocks he had found it altogether a better time than midwinter for making the cuttings. True, if they could be planted early in the fall, the ground being warmer than the atmosphere, of course they would form roots, and thus be ready in spring to push forward their growth.

Mr. Bateham said his experience in the nursery business differed from Mr. Elliott's in the matter of success with cuttings; he greatly preferred those made in the fall or early in winter, to those cut at a later period.

Mr. Storrs said he preferred to prune grapes in November for the cuttings.

Mr. Ensign thought the fore part of December a good time to prune hardy grapes—summer prunes in June and July.

Mr. Brayton was convinced that grape buds make some growth or development during the winter, hence he believed there was advantage in early pruning.

Mr Dean asked whether in case of fall pruning of grapes, it would not be found necessary to leave one or two buds on each shoot more than was desired, and go over the vines again in the spring and cut them off, owing to the danger of the ends of the shoots, where cut, being killed by the winter?

Mr. Elliott said he believed experience proved that there was very little danger of that kind, if the pruning was done as early as November.

Dr. Warder, by request, gave a brief lecture on the different methods of pruning and training grapes; illustrating the subject by drawings on a blackboard, evincing very full understanding of the subject, as well as aptitude in imparting knowledge to others.

THE CINCINNATI METHOD OF TRAINING AND TRIMMING.

In response to queries, Dr. Warder stated that the common plan of training in the southern portions of the State, was that known as the spur and bow method, with a stake to support the vine. This system requires a very different mode of trimming from that pursued when training on the trellis, though the principle of removing the bearing wood annually is the object in both instances. At the time of the winter trimming, the best new cane, coming out from the stalk as low down as possible, is selected to form the bow for next year's fruitage; this is shortened according to its strength, to a length of from two to four feet; and a low shoot is also selected, which is cut down to two eyes, forming the *spur* from which two canes are to be grown next season. All the rest of the wood is removed from the vine at the winter trimming. The vineyard thus pruned presents a very bare appearance, and the novice will think it ruined, and that there can be no crop the next season, but experience shows us that there is always danger of over-fruiting the vine. The well being of a vineyard that is trained in this way will depend upon the manner in which the summer pruning has been conducted, and this will be recurred to under the appropriate head. The period at which the trimming should be done is at any time when the plant is dormant—after the falling of the leaf and before the first starting of the buds in the spring. No plant should be cut when it is frozen, and it has been a very common custom to trim during mild weather in February, or early in March; but recently fall trimming is being more and more practiced. November is a good period, as the vines have then become completely dormant, though in a warm time the cut ends may bleed a little. After trimming, the vines being loosened from the stakes, are in a condition to be laid down for the winter protection, if this is considered desirable, and the experience of the last severe winter has induced many to think it important to endeavor to protect the vines in future; though few vineyards in that section of the State have ever received any care during the winter.

Training.—This consists of two quite different operations, the spring and the summer training. The former will first be considered. In the stake method the vigneron waits until the buds have begun to swell, and the sap has filled the vine and rendered it more pliable. Taking the end of the branch in his right hand he gives it a slight twist, supporting the middle of the cane in his left hand, he bends the shoot so as to form a bow, bringing the point down to the stake, where it is secured by a willow band. The middle of the bow is then tied to the stake at such a point as to make an even regular sweep of the cane, from the place where it leaves the stalk to that where the point is secured to the stake. This may be a circle, or the segment of a circle, greater or less, according to the length to which the cane had been cut; the diameter of the bow is generally about a foot, and the plane of the bow should be placed in the direction of the row of vines.

Summer training and *summer pruning,* or trimming, are conducted simultaneously, and need to be considered and discussed in the same paragraph. The former consists in tying up the two young canes that spring from the spur, and which are grown for the formation of the next year's bows. The bearing branches need very little training, but should receive great attention in the trimming, otherwise some of them will outgrow the canes, which will be so dwarfed as to render them unfit for making bows. Here lies the great importance of proper attention being paid to summer pruning, which has the double purpose of thinning and reducing redundant growth, and at the same time regulating the foliage and of directing the flow of sap into the canes or renewal shoots.

The first summer pruning should be commenced as soon as the buds have grown out a few inches in length, when the leaves are half expanded, and the blossom buds can be seen distinctly. Wherever two shoots have come from one bud, the weaker should be rubbed off; all "water shoots" or suckers must be broken out at the same time. *Pinching* may now be done, removing the tip of the shoot a couple of leaves beyond the bunch of grapes. This is done with the finger nail with great ease.

The object in pinching the tips thus early in the season is two-fold—first, to direct the growth of wood to the canes from the spur, which are tied up to the stake as fast as they grow to secure the same end; and, secondly, to check the too rampant growth of those bearing branches, and thus to render them more fruitful. This is secured by another result of the early pinching, which has the effect of making the leaves expand to a greater size. The new buds in their axils are rapidly developed, and very soon push out laterals, thus providing a new crop of foliage, which, in its turn, must again be pinched later in the season, to control the excess of growth and to cause the greater expansion of the leaves. By this mode of proceeding a healthy growth of vigorous foliage is secured, to assist the development and ripening of the fruit later in the season, when the older leaves may have become dry or injured. The summer training of the canes requires repeated attention, to lead them up the stakes until they reach the top; and all laterals are to be pinched off to this point. When the canes continue to grow beyond the tops of the stakes they are trained horizontally or allowed to hang down, and the laterals are left to grow as they will. The old system of shortening these canes at or near the top of the stakes is believed to be very prejudicial to the vines. The excessive thriftiness must have an outlet, and when the canes are cut or broken, the result is the bursting of the buds that are intended for the next year's crop, and strong laterals are thrown out. It is found that if allowed to grow at will, after reaching the tops of the stakes, there is no difficulty about the development of the lower buds which are to produce the next crop of fruit; and this very development is the object aimed at, as in the practice of shortening-in, of our fruit trees, or summer pruning.

It will be observed that the stake method of grape training is essentially the *renewal* system, as much so as where the vines are trained upon a trellis; but it should also be observed that its simplicity is its greatest recommendation, and that it is readily comprehended by the common laborer, whereas it is notorious that the trellis training is seldom found to be completely a renewal system, but that it is often impossible to produce strong, alternate canes to take the place of the bearing wood of the past year, and hence it becomes necessary to retain these and to adopt the spur system with them, on portions of the trellis. Another advantage, beside the simplicity of the stake and bow method of applying the renewal system, is that, if the vines be planted sufficiently wide, a better circulation of air will be secured than where continuous trellis walls of foliage cross the vineyard. This is believed to be a matter of great moment, and worthy of consideration by the vine planter, and thus we find that the spaces between the stakes has been greatly extended since the introduction of vine culture into our country.

SUMMARY.

To repeat: Trim when the vines are dormant, but not frozen; remove all redundant wood, leaving only so much for fruit as the strength of the vine vill enable it to ripen, but avoid such severity of pruning as will force an excessive wood growth.

So soon as the young shoots have attained the length of a few inches, remove all redundant growths and all the ground suckers. Before blossoming, pinch the ends of all very strong fruit branches that spring from the bow, to control them, to make better foliage, and new leaves on the laterals that are thus forced out, and to encourage the vigorous growth of the canes that spring from the spurs, and which should be tied up from time to time, and relieved of their laterals till they reach the top of the stake, after which they may be allowed to grow at random, or may be trained horizontally from stake to stake.

In attempting to give directions to those whom we would encourage to embark in the cultivation of this delicious fruit, we should endeavor to avoid making too much of the difficulties that are incident to the work in hand. In the preparation of the soil, planting and training, there should be no mystery. Every thing connected with grape-growing is perfectly simple and plain, and there need be no difficulty in the matter; but some teachers have been so minute in their directions as to discourage many who might otherwise sit in comfort and with great satisfaction under their own vine, and gather the rich clusters that will be sure to reward them for their care.

DISCUSSION ON GRAPE SOILS.

Dr. Dake said he considered clayey, calcareous soils the best for grapes; he thinks the roots descend too deeply in sandy soils, thus preventing the early ripening of the fruit.

Dr. Kirtland said he had not done very much with grapes; had made some experiments with lime; perhaps unsafe to give results till more time for observation, but will venture an opinion. The sandy lands of the lake shore, he believes, would be improved by the application of lime, although for grapes only a very small quantity is needed; and how can this best be applied? He had tried caustic lime, carbonate, and sulphate, in various modes and quantities, and has come to the conclusion that the sulphate (Plaster of Paris) is the best form, and that only one to one-and-a-half bushels annually per acre is requisite to supply the amount of lime necessary for the grape crop. Carbonate of lime, as old mortar, etc., is good, especially if broken fine, so that it can be dissolved. Water in his well contained no lime. Catawba grapes ripened well on his soil for a few years, then were poor till lime was applied. Isabella the same, but more variable. The subsoil is gravel—old lake ridge 12 to 20 feet to water.

Mr. Cowdery said around Sandusky lime and ashes had not generally produced any good result. Mr. Kelley, on the Island, recommends the application of a little salt. He had, recently, given much attention to the subject of grape soils, and was glad to hear it discussed, for it was a matter of much importance to all who contemplated vineyards. There was much diversity of soils around Sandusky, and even on the Islands; and he had no doubt that in time it would be found here, as in Europe, that the quality of the wine will be greatly affected by the character of the soil; especially with such sensitive grapes as the Catawba.

Dr. Dake said he had used leached ashes on sandy soils, and found it very stimulating to the growth of vines, but not beneficial for the production of fruit.

Dr. Kirtland said he had found his gravelly soil contained felspar which yields sufficient potash; hence no need of ashes.

Mr. Miller said in the central parts of the State the best grapes were grown on gravelly hills, abounding in lime-stone.

Mr. Ensign said his vineyard was on sandy and gravelly soil; water somewhat hard, probably contains but little lime; part of the land slopes to the south; this is most liable to injury from frost, partly owing to moisture of the subsoil; had used leached ashes; stimulated the growth of vines, with little benefit to crop; on very poor lands should think it good.

Mr. Elliott referred to the theory of Dr. Dake, respecting the roots being too deep for the early ripening of fruit, and said it was contrary to the teachings and practice of the oldest vine-growers, who cut off all the upper roots of their young vines and foster the growth of the lower roots, wishing to have none near the surface.

Dr. Dake replied that this might answer in deep, loamy soils, where the heat of the sun penetrates deeply and is retained a long time; but in sandy soils, and where moisture rises more or less from beneath, he thought the result would be different.

DISCUSSION ON APPLES.

(REMARKS ELICITED WHILE REVISING THE CATALOGUE FOR OHIO.)

BALTIMORE (*Of Elliott.*)—Mr. Ferris, of Painesville, thinks it should be called Hoary Morning; was introduced in N. E. Ohio in 1820.

Dr. Kirtland said it is a synonym of Cable's Gilliflower.

Mr. Elliott thinks it is not Hoary Morning.

BELLFLOWER.—Motion was made to strike out the remark in last catalogue "not very productive or reliable." Mr. Scott, of Toledo, counts it productive and of high quality.

Mr. Ferris finds it unprofitable.

Mr. Ensign finds it bears well every alternate year.

Mr. Marshall, of Massillon, thought it rather variable as a bearer.

Dr. Kirtland said it was good on lime-stone soils, but variable on all.

Dr. Warder concurred—best on lime-stone soils, not over rich.

EARLY GEORGE.—Mr. Marshall finds this a poor bearer, but early and of good quality.

Mr. Bateham knows nothing of its productiveness, but the fruit is good, ripens early, and tree a good grower. It is not identical with White Juneating; would like to hear from others as to its productiveness. He presented the following extract of a letter from N. L. Wood, of Jefferson county, who has the Early George and White Juneating in bearing:

"The White Juneating is a very mild, pleasant little apple, valuable only on account of its ripening before any other; it is nearly round, with a slender stem three-fourths of an inch long. The Early George is a larger apple, more flattened, and with a stout, fleshy stem, set obliquely, skin a little rough, inclined to russet around the stem; ripens at same time as Early Harvest, and not so good an apple; too acid for pleasant eating."

EARLY HARVEST.—Mr. Elliott moved to strike out of the catalogue the remark "not a good grower or profitable;" which was carried; but the Secretary states that he never yet found a market fruit-grower who counted it a profitable variety.

EARLY STRAWBERRY.—Mr. Dean said he had three objections to this apple—small size, poor fruit, and poor grower.

Mr. Scott finds it good; one of the best of its season.

Mr. Elliott once thought it ought to be stricken from the list, but has changed his opinion; though the fruit is too small for market.

Mr. Bateham had seen this variety quite profitable even for market, grown on strong lime-stone soils, near Columbus; the tree is not a poor grower, nor the fruit very small, except on poor soil.

ENGLISH RUSSET, or Poughkeepsie Russet, was, on motion, stricken from the catalogue.

FALL WINE.—Several members expressed their approval of this variety; moved that the words "little known" be omitted in the revision of the catalogue.

FINK.—Mr. Bateham said that this variety was not only valuable for its keeping qualities, but also for cider, the making of which can be deferred till spring. Its quality is only excelled by the Virginia crab. He was intending to plant fifty trees of it the coming season.

GARDEN ROYAL.—Dr. Beardslee thinks this the best apple for eating he ever tasted; others present spoke highly of it.

GOLDEN RUSSET OF N. Y.—Mr. Dean said this apple was well known and much esteemed in the north-east; is the best of the Russets; keeps longer than the Roxbury.

HIGBY SWEET.—Dr. Kirtland thinks it the best sweet apple of its season.

KING OF T. CO.—Mr. Scott has it bearing; trees top grafted bear abundantly.

Mr. Ferris thinks the fruit not first-rate.

Col. Harris knows a lady who thinks it one of the very best cooking apples.

Mr. Boalt, of Norwalk, thinks it does not come up to its eastern reputation.

Mr. Storrs knew it well, years ago, in Tompkins county; only a fair bearer; uniformly smooth and handsome.

LADIES' SWEET.—Mr. Dean said there was a spurious variety of this fruit, of duller color and imperfect quality; the genuine was very good.

COGSWELL.—Mr. J. M. Curtis, of Brooklyn, O., said this was a very good winter apple, deserving more general cultivation; tree a fair grower and good bearer. Mr. Marshall and Mr. Bateham expressed their conviction that the Cogswell is quite distinct from Ohio Nonpareil; and that both varieties were deserving more attention.

SHENANGO STRAWBERRY.—Several members spoke very highly of this fruit, and, on motion, it was added to the list; also the Sweet Russet.

BEN. DAVIS was also highly recommended for trial in Southern and Central Ohio; succeeds finely in Indiana as far north as Ft. Wayne.

THE BEST SIX OR TWELVE MARKET APPLES.

At the close of the discussion on apples, it was proposed that those who were present from different parts of the State, and had experience in growing apples for the markets, should give in writing a list of what they consider the best six varieties of winter apples for market; also the best twelve, if they can name so many really good sorts. Only a few of the gentlemen present complied with the request; and hence, in order that a larger portion of the State might be embraced in the report, the Secretary wrote to half a dozen or more fruit growers, in different parts of the State, asking them to name such kinds as they would recommend as the best six or twelve. The following is the result:

By **C. W. ENSIGN**, *Madison, Lake Co.*—(Sandy soil, three miles from the lake.)—Best six: Baldwin, Rhode Island Greening, King of T. Co., Hubbardston Nonsuch, Peck's Pleasant, Esopus Spitzenberg. Second six: Red Canada, Westfield Seek-no-further, Canada Rernette, Belmont, Wagener, Baltimore.

R. MARSHALL, *Painesville.*—(Two miles from the lake.)—Rhode Island Greening, Baldwin, Peck's Pleasant, N. Spy, Red Canada, E. Spitzensberg.

GILES BOALT, *Norwalk.*—Best six: Rhode Island Greening, Bellflower, Red Canada, Seek-no-further, Fallawater, Peck's Pleasant. Add for twelve: Wagener, Northern Spy, King of T. Co., Dominie, Twenty Ounce, or Cayuga, Smoke House.

N. L. WOOD, *Smithfield, Jefferson Co.*—Best six: N. Spy, Fallawater, Rome Beauty, Smith's Cider, Grimes' Golden Pippin, Baldwin. For 12 add: Peck's Pleasant, Culp, Winter Pennock, Willow, Roxbury Russet.

By GEO. W. DEAN, *Kent, Portage Co.*—(Ten miles from lake.)—Best six: Peck's Pleasant, R. I. Greening, Baldwin, Canada Red, King of T. Co., Roxbury Russet. For 12 add: N. Spy, Golden Russet of N. Y., Baltimore, Fallawater, Seek-no-further, Hubbardston's Nonsuch.

By A. L. BENEDICT, *Ashley, Delaware Co.*—Best six: May, Swaar, Westfield Seek-no-further, Fallawater, Ortley, Stark. I place them in the order I think they should stand, as it regards merit. For 12 I would add: Rox. Russet, Golden Russet, Roman Stem, Limber Twig, Bellflower, White Pippin.

The foregoing are named with reference to market only. For table or family use I would choose the following 12: Bethlehemite, Belmont, Sweet Vandervere, Talman Sweet, Red Winter Sweet, Fallawater, Wine Sap, Swaar, Seek-no-further, Rambo, Peck's Pleasant, Pumpkin Sweet.

By M. B. BATEHAM, *late of Columbus.*—(For clay soil.)—Best six: White Pippin, Fallawater, Smith's Cider [or Ben. Davis,] Stark, Wine Sap, Talman Sweet. For 12 add: Dominie, Liberty, Fink, Willow, Jonathan, Paradise Sweet.

By WM. S. IMLAY, *Zanesville.*—Best six: Rox. Russet, Baldwin, Belmont, Canada Red, Seek-no-further, Fallawater. For 12 add: Peck's Pleasant, N. Spy, Flushing Spitzenberg, [Baltimore?] Winter Pearmain, Prolific Beauty, Willow Twig.

By JAS. EDGERTON, *Barnesville, Belmont Co.*—Best six: Large Striped Winter Pearmain, Baldwin, Fallawater, N. Spy, Dominie, Bentley Sweet. For 12 add: Fink, Paradise Sweet, Seek-no-further, Lop Side, Rawles' Janet, Swarr. (We hope the Swaar will prove sufficiently productive for profit; if not, we may put King or Wagener in its place.)

By Dr. J. W. WARDER, *Cincinnati.*—Best six: Ben. Davis, Broadwell, Rawles' Janet, Jonathan, White Pippin, Yellow Bellflower. For 12 add: Red Canada, Newtown Pippin (green,) Smith's Cider, Pryor's Red, Wine Sap, Cannon Pearmain.

By ROBERT BUCHANAN, *Cincinnati.*—The best six winter apples for market with me are: White Pippin, Fallawater [Tulpehocken,] Rome Beauty, Rawles' Janet, Wine Sap, Smith's Cider. For 12 add: Virginia Greening, Rambo, Belmont, London Sweet, Campfield, Romanite. The Virginia Greening and Romanite are good for late keeping rather than quality. I have not tested Ben. Davis, but it promises well here.

By Capt. H. N. GILLETT, *Lawrence Co.*—the most southern part of the State.—I herewith submit a list of ten varieties of winter apples, the most profitable for market for this section of the State. It must be borne in mind that some sorts counted *best* for quality are worthless for quantity or profit. Ben. Davis is very beautiful, productive and profitable, and so is also Black Coal and Columbian Russet; but Rome Beauty is the most profitable of all. Pryor's Red is a fine apple and good keeper, but shy bearer while young. Red Cedar is a great keeper, and good for cider as well as for table. Roxbury Russet, Rawles' Janet, Wine Sap, White Pippin.

Letter from R. W. STEELE, *Dayton*. * * * "In attempting to give a list of what I deem the best six winter apples for market, I find it a more difficult task than I at first supposed. A few years ago it would certainly have been very different. I can recollect when those excellent varieties, the Newtown Spitzenberg, American Golden Russet, Yellow Bellflower, and the like, succeeded splendidly in my orchard; but now they are shy bearers and the fruit defective. I hope that this may be the result of disease, which, like the pear blight with us, will pass away. If I were now planting for market, I would select: White Pippin, Wine Sap, Smith's Cider, Romanite, Jonathan, Baldwin. The last-named I place in the list at the suggestion of an extensive fruit-grower and nurseryman of this neighborhood."

LETTER FROM DR. PETICOLAS, MT. CARMEL, CLERMONT COUNTY, OHIO.

"It may perhaps appear strange that out of one hundred and twenty or thirty varieties of apples which I have in bearing, on trial, that it is difficult for me to select six varieties of good winter apples for market, but no less strange than true; not that there are not plenty of winter apples, but unfortunately few of them arrive at sufficient perfection to enable us to denominate them *good for market*. There seems to be some peculiarity in the soil, or variations of temperature, to cause this disagreeable circumstance. I allude to the never-failing mildew or scab to which our apples are subject. Although some seasons they are not quite so bad as others, still one-half or more, as a general thing, are unfit for market, and it is really humiliating to think that we, who a few years ago used to brag over our Eastern friends of the superior size and beauty of our fruit when compared with theirs, should now have to acknowledge that they beat us—in evidence of which, all we have to do is to look at the market quotations, $3.50 for Western and $4.50 for Eastern apples, which is about the usual proportion. Now, why is this? Why should such a change have taken place? No such alteration, that I am aware of, has taken place in the East; their apples are as fair and good now as they were twenty or thirty years ago. Besides, many of our varieties have ceased being as prolific as they were fifteen years ago. I had Ramboes, seven years old, which bore ten bushels of good fruit, which, since, have never borne over four or five, even in the most favorable seasons of inferior fruit; Redstreaks, at the same time and age, bore thirteen bushels, which have never any one season since borne more than three or four of comparatively poor fruit. Nor can this be attributable to the age of the tree, for I have the same varieties of all ages, where it is nearly if not quite as bad. The White Bellefleur (Ortley), for instance, was formerly one of our finest and best apples, and can no longer be recognized as the same, being so knotty and scabby, and not producing one-fourth which it did formerly. White Winter Pearmain is another of our best keeping and finest flavored dessert apples, and is no longer even fit to look at, being perfectly disfigured with scab. But it is useless naming varieties which have deteriorated in this way, or I would never have done. Nor to point out the cause of this calamity do I consider of much importance, for I believe it entirely beyond our control, being satisfied, from long observation, that it is entirely owing to variations of temperature. The question therefore arises, Why should our climate have become so different from what it was formerly? I will not make my communication tedious by enumerating the various experiments I have tried to ascertain the cause of this vexatious circumstance, but will merely state a couple of facts which I think will go far to prove that it is the sudden changes of temperature between day and night.

"When I first turned my attention to the cultivation of fruit, I planted a number of grape vines along an arbor, the top of the arbor leaning against the house on the southeast side, about fifteen feet off. These vines I trained over the top of the arbor and then tacked them against the house. After being in bearing a few years they began rotting badly, with the exception of the part nailed to the wall, where they were as fine and sound as any one could desire. This caused me to conclude that it must be owing to the fact of the wall absorbing heat during the day and radiating it at night, thereby equalizing in a measure the temperature.

"Every one who has a vineyard must have observed that the mildew and rot supervene after some sudden change in the temperature, particularly when accompanied with rain. Now, the same thing takes place with apples and other fruits.

"Prince's Harvest was formerly one of our best and earliest apples for market. I have ten trees, from which I have not picked ten perfect specimens in as many years, although they bear quite abundantly, but are particularly affected with mildew and cracking badly. This induced me to notice this particular variety very closely for the last five or six years, and invariably I have discovered spots of mildew on the young fruit immediately after a cold night, when the thermometer indicated a change of 20° or 30°. Nor does this take place when the fruit is of the same size. Some times the apples are as large as shellbark hickory nuts, and other seasons when not half so large. This can be distinctly seen and known by the formation of dark colored spots on the surface, which appears to arrest the growth of the apple immediately under those spots, generally more on one side than the other, causing the fruit to be one-sided. The expansion and contraction bring on a diseased action, which is the cause of the cracking and scabbiness of the fruit.

"The same effect is produced with pears and cherries, and I suppose would be with plums, if the curculio would allow us to have any. But '*revennons a nos moutons.*'

"I think Smith's Cider, Pryor's Red, White Pippin, Rhode Island Greening, Roxbury Russet and Rome Beauty the best six winter apples for market. Newtown Pippin, if mildew could be avoided, would stand number one. Rawle's Janet and Romanite are good keepers and do not scab, but they are too small for profit.

"February 16th, 1865."

NOTE.—Before going to press we have been called upon to mourn the loss of this very devoted pomologist, who spent the last years of his life in the devoted pursuit of pomology, and for many years contributed to the instruction of his fellow-citizens by his excellent exhibitions of correctly named fruits. W.

LETTER FROM GEN. JAS. T. WORTHINGTON, CHILLICOTHE, OHIO.

"In answer to your letter, I send a list of six of the winter apples most esteemed here as productive, saleable and hardy; also a list of twelve winter, fall and summer. I can only give the local names of some of them, marked *. The list will perhaps be old-fashioned, but I give none which are not now hardy and productive in one or more of the orchards in this neighborhood, some trees now bearing fine crops of sound apples, though over sixty years old:

"*Early Winter.*—Chillicothe Pearmain,* Rhode Island Greening, Lady-Finger* or Chillicothe Pippin, so called in Cincinnati.

"*Late Winter.*—Rock Rimmon [Rawle's Janet], Newtown Pippin, Milan.

"Best twelve varieties for the neighborhood of Chillicothe:

"*Summer.*—Early Bough, Early Red,* Strawberry Red.

"*Fall.*—Garden Apple,* Fall Pippin.

"*Winter.*—List as above, to which I would add the large Golden Russet, and, for cider, the Hughe's Crab.

"I become every year more convinced of the necessity of belts of trees in our climate of great extremes, to protect the annual crops from the late frosts and the fervid suns of July, August and September, and I verily believe that if one-third of the land was devoted to belts of fruit and other valuable trees, the remaining two-thirds would produce as much as the whole without such shelter, even in average years, and far more in extreme seasons; but I fear it is too early to preach planting trees to a generation which considers it the chief end of man to destroy them."

FRUIT CATALOGUE FOR OHIO.

The American Pomological Society having issued, in 1862, a "Catalogue of Fruits for cultivation in the United States and Canadas, compiled from the reports of State and District Committees," our Society, at its next meeting, resolved to take up this catalogue and carefully revise it with reference to its adaptation to the State of Ohio; and, inasmuch as the different sections of the State are so diverse in soil and climate, that fruits which succeed well in one section are sometimes worthless in others, it was thought best to divide the State into *five sections*, thus:

North-eastern—geological character—sandstone, conglomerate and coal measures.

North-western—cliff limestone and shale, drift mostly clay loam—plains.

Eastern, including also the South-eastern—sandstone and coal measures.

Central, including central western—cliff limestone and shale—clayey drift.

Southern, including South-western—mostly blue limestone, with marl and clay—hills and river valleys.

For each of these sections, it was agreed there should be a separate column in the catalogue, with such signs or marks as would indicate whether the variety of fruit named was known and approved, or otherwise, in that section. The mode of proceeding adopted was, for the chairman to read off the names as they occur in the list, then call upon the members present from each section, in turn, to express briefly their opinions, the Secretary noting down the same in their several columns.

In this way the whole catalogue was gone over, with Apples, Peaches and Pears; and the results were compiled in a convenient form—devoting the first page to brief remarks, and the second to the tabular columns. This catalogue was revised in 1863, and again at the present meeting, and the whole is republished in this report.

APPLES.

Explanation of Columns.—The figures preceding the names refer to corresponding figures on the opposite page, to save repeating the names.

The first column, *Season.* S. stands for summer; A. autumn; W. winter; E. early; L. late. Those not designated early or late, may be regarded as medium.

The second column, *Use.* K. kitchen, or for cooking; M. market (or *money*); C. cider. Those not designated may be regarded as for desert or general purposes. Those marked A. are specially for amateurs, being too small, or otherwise unsuited for profit.

In the remaining columns, three dots thus, ... signifies that the variety is not sufficiently known or tested in that district; a dash — signifies that it is known, but does not succeed well, or is not approved; a star thus, * signifies it is generally approved; two stars, ** much approved; a dash and star, —* approved by some persons, or does well in some localities, not in others.

APPLES.

1. Alexander, showy, but poor quality; not approved or much grown.
2. Am. S. Pearmain, fruit approved, but Benoni as good, and grows better.
3. Ashmore, little known in Ohio; approved by some.
4. Astrachan Red, generally commended, especially for market.
5. Autumn Swaar (sweet), not generally known; some like it.
6. Baldwin, good North and East, and in some localities South.
7. Baily Sweet. approved where known; not sufficiently tested South.
8. Baltimore (of *Elliot*), American Beauty, good market apple, North and East.
9. Bellflower, generally approved; not everywhere reliable.
10. Belmont, very popular North and East; not so good South.
11. Beauty of Kent, not generally known or approved.
12. Benoni, much approved where known; especially South.
13. Bentley Sweet, good, late winter; not generally known.
14. Blue Pearmain, not much approved; coarse and inferior.
15. Broadwell, known only central and South; approved there.
16. Bullock's Pippin, small, but fine flavor; for amateurs only.
17. Canon Pearmain, Southern; long keeper; little known.
18. Carolina June, not generally tested; approved Southwest.
19. Chenango Strawberry, new, much approved where known.
20. Cogswell, not generally tested in Ohio; good North.
21. Cooper, good, but variable; poor grower; not generally approved.
22. Cooper's Market, little known; approved by some.
23. Danver's Winter Sweet, generally approved where known.
24. Dominie, not generally known; good and profitable for market.
25. Dutch Mignonne, showy, but too sour; little known.
26. Duchess of Oldenburg, handsome and fair quality.
27. Dyer, or *Pomme Royal;* generally approved where known.
28. Early George, little known; similar to *Harvest;* better grower.
29. Early Harvest, approved by all, but not always profitable.
30. Early Joe, small fruit, but very good; for amateurs only.
31. Early Pennock, or *August;* good for market and cooking.
32. Early Red Margaret, small, little known; not generally approved.
33. Early Strawberry, generally approved, though rather small.
34. Fallawater (*Tulpehocken*), large and popular everywhere, though second rate.
35. Fall Pippin, good and popular, not very productive.
36. Fall Jennetting, approved only for cooking and market.
37. Fall Queen of Kentucky, approved South; little known elsewhere.
38. Fall Wine, handsome and good, but slower grower.
39. Fameuse, generally approved where known; especially North.
40. Fenton, or Trumbull Sweet, handsome and good; not generally known.
41. Fink, new, very long keeper; resembles *Tewksberry Winter Blush.*
42. Fort Miami, not much known; approved Northwest.
43. Fourth of July, or *Siberian August;* resembles *Tetofsky;* handsome, new.
44. Garden Royal, for amateurs only; little known in Ohio.
45. Gilpin, or *Romanite;* approved as a long keeper; small, second rate.

	Season.	Uses.	N. Eastern.	N. Western.	Eastern.	Central.	Southern.
1	E. A.	K.	—	—	...	—	—
2	S.	A.	...	*	*	*	*
3	A.		...	...	*	...	*
4	E. S.	K. M.	*	*	*	*	*
5	A.		*	...	...	...	*
6	W.	M.	**	**	*	—	—
7	E. W.		...	*	...	*	...
8	W.	M.	*	*	*	—	...
9	W.	M.	—	*	—	*	*
10	E W.		*	*	*	—*	—
11	A.	M.	—	...	...	—	—
12	S.		...	*	...	*	*
13	W.		...	...	...	*	*
14	E. W.		—	—	...	—	—
15	W.		...	*	...	*	*
16	W.	A.	...	*	*	*	*
17	L. W.	M.	...	...	...	...	*
18	E. S.	M.	...	...	...	...	*
19	E. A.		*	...	...	...	...
20	L. A.	M.	*	*	...	...	...
21	A.	A.	...	...	—*	—*	—*
22	L. W.	M.	—	...	...	...	...
23	W.		*	*	...	...	...
24	W.	M.	...	—*	*	*	*
25	E. W.	K. M.	—	*	...	—	—
26	E. A.	K. M.	*	*	...	...	—
27	A.		...	*	...	*	—*
28	E. A.		...	...	...	*	...
29	E S.		*	*	—*	—*	*
30	S.	A.	*	—	—	*	*
31	S.	M.	...	...	*	*	*
32	E. S.		...	*	...	...	...
33	S.		*	*	*	*	*
34	W.	M.	*	*	**	**	—*
35	A.	M.	—*	**	*	—*	—*
36	A.		—	...	...	...	...
37	L. A.		...	...	...	...	*
38	A.		—*	*	...	—*	*
39	A.	M.	—*	*	—	*	*
40	A.		*	...	...	...	*
41	L. W.	C. M,	...	...	*	*	...
42	W.		*	**	...	...	...
43	E S.	M.	...	...	*	*	...
44	A.	A.	*	...	...	...	...
45	L. W.	C. M.	—	—	—	*	*

APPLES.

46. Golden Russet, of New York, one of the best of Russets; generally approved.
47. Golden Sweeting, everywhere productive and profitable; second rate.
48. Gravenstein, handsome and good; not very productive.
49. Green Sweet, productive and good; approved where known.
50. Grimes' Golden Pippin, new; much approved where known.
51. Hawthornden, very productive and fair; second rate.
52. Hewe's Virginia Crab, valued only for cider; poor grower.
53. Higby Sweet, new, handsome and good; approved Northeast.
54. High-top Sweet, or *Summer Sweet;* small, but approved as earliest sweet.
55. Holland Pippin, or *Summer Pippin;* not generally known; good for cooking.
56. Hubbardston Nonsuch, good and popular, especially North.
57. Jeffries, new, promises well; approved where known.
58. Jersey Sweet, excellent for dessert; popular where known.
59. Jonathan, beautiful and first rate fruit, but a slender tree.
60. Kaigns' Spitzenberg, large and showy; second rate; profitable sometimes.
61. Keswick Codlin, esteemed for cooking and market.
62. King, of T. Co., handsome and good; best at the North.
63. Ladies' Sweet, handsome and good, but over-praised East.
64. Lady Apple, small, but profitable, in some localities.
65. Large Striped Pearmain, not generally known; good South.
66. Large Yellow Bough, or *Sweet Bough;* good everywhere.
67. Liberty, new, good late keeper; not extensively known.
68. Lowell, or *Orange;* productive and profitable; generally approved.
69. Lyman's Pumpkin Sweet, large, sweet and good; not very productive.
70. Maiden's Blush, very productive and profitable everywhere.
71. May of Myers, approved as a late keeper; second rate.
72. Melon, little known in Ohio; approved by some.
73. Milam, rather small, but very productive and popular in some parts.
74. Munson Sweet, approved where known for apple butter and cider.
75. Newtown Pippin, does not generally succeed in Ohio; good some places.
76. Northern Spy, popular North, but a very tardy bearer.
77. Ohio Nonpareil, or Myers' Nonpareil, very handsome and good.
78. Ortley, not as good as formerly in Ohio, best on new lands.
79. Paradise Winter Sweet, approved where known; not over productive.
80. Peck's Pleasant, one of the best, for North and East especially.
81. Pomme Grise, small, but excellent; for amateurs only.
82. Porter, good North and East; not a strong grower.
83. Primate, not generally known, but esteemed where known.
84. Pryor's Red, good in some localities; not very reliable.
85. Rambo, well known, generally popular.
86. Ramsdell Sweet, or *English Sweet;* productive and profitable; good grower.
87. Rawle's Janet, much approved South and Southwest; small North.
88. Red Canada, good and popular, especially North; slender grower.
89. Rhode Island Greening, good North, and sometimes East, not South.
90. Ribston Pippin, not much known in Ohio.
91. Rome Beauty, very profitable and popular in Southern Ohio.
92. Roxbury Russet, generally good North, and some localities South.

	Season.	Uses.	N. Eastern.	N. Western.	Eastern.	Central.	Southern.
46	L. W.	M.	*	*	...	*	*
47	S.	M.	*	*	*	*	_*
48	E. A.		**	**	*	*	—
49	W.	K.	—	...	...	...	...
50	W.		...	...	**	...	...
51	A.	K.	—	—	...	_*	—
52	W.	C.	...	...	*	*	*
53	A.	A.	*	...	...	...	...
54	S.		...	...	*	*	*
55	L. S.	K.	...	*	...	...	...
56	E. W.	M.	*	*	*	_*	_*
57	E. A.	A.	...	...	*	*	...
58	E. A.		*	*	...	*	...
59	W.	M. T.	*	**	*	**	**
60	E. W.	M.	...	—	...	_*	_*
61	S.	K.	*	*	...	_*	—
62	E. W.	M.	**	*	...	...	...
63	W.		...	*	...	...	*
64	W.	A.	*	*	...	_*	_*
65	W.	M.	...	...	*	...	...
66	S.	A.	*	**	*	*	_*
67	L. W.	M.	...	...	...	*	...
68	A.		*	*	*	*	*
69	L. A.	K.	—	—	_*	*	—
70	A.	K M.	*	*	**	**	**
71	L. W.	K. M.	...	...	...	*	...
72	E. W.		*	*	...	...	*
73	W.		...	...	—	*	*
74	A.		*	*	...	*	...
75	W.		—	_*	—	—	_*
76	W.		*	**	*	_*	—
77	A.	K. M.	*	*	*	...	...
78	W.		—	—	—	—	—
79	W.		*	...	*	*	...
80	E. W.		**	**	*	_*	...
81	W.	A.	*	*	...	...	*
82	E. A.	M.	*	**	*	*	*
83	L. S.		*	*	*	*	...
84	W.		...	—	—	—	*
85	E. W.		*	*	*	*	*
86	E. W.		—	—	*	*	*
87	L. W.		—	—	...	**	*
88	W.		*	**	**	*	*
89	W.	M. K.	**	**	*	—	—
90	E. W.		—	—	*	_*	—
91	W.	M.	—	*	*	*	*
92	W.	M.	*	*	*	*	—

APPLES.

93. Saint Lawrence, showy and good; approved North.
94. Smith's Cider, very productive; profitable for market central and South.
95. Smoke-house, approved by Pennsylvania, North and East.
96. Sops of Wine, good and popular wherever known.
97. Spafford Russet, not extensively known; popular North-west.
98. Spitzenberg Esopus, generally approved north; not reliable South.
99. Stark, (see last report, page 5), approved where known, new as yet.
100. Summer Queen, good and reliable, but not a great bearer.
101. Summer Rose, much esteemed, as an amateur variety only.
102. Swaar, good at the North, not so reliable South.
103. Sweet Russet, or Pumpkin Russet.
104. Talman Sweet, very productive and good, especially North.
105. Tetofsky, very showy, not generally known.
106. Trenton Early; approved where known for table and market.
107. Twenty Ounce Apple, large, showy, second rate; approved by some.
108. Vandervere of N. Y., or *Newtown Spitzenberg*; generally good central and S.
109. Wagener, not generally known; promises well.
110. Westfield Seek-no-further, much esteemed North; not valuable South.
111. White Pippin, popular wherever known, especially central and South.
112. White Winter Pearmain, much esteemed in South-west.
113. Williams' Favorite, not generally known; esteemed by some.
114. Willow Twig, good only as a late keeper; poor grower.
115. Wine Sap, good and reliable, central and south; moderate grower.

	Season.	Uses.	N. Eastern.	N. Western.	Eastern.	Central.	Southern.
93	A.		*	...	...	...	—
94	W.	M.	*	...	...	*	*
95	E. W.	M.	*	*	*	...	...
96	S.		*	—*	...	*	*
97	W.	A.	...	*	...	...	...
98	W.		—*	*	*	—	—
99	L. W.	M.	...	...	...	*	...
100	S.	K.	*	*	*	*	*
101	S.	A.	*	*	*	*	*
102	W.		*	*	*	—	...
103	E. W.	M. K.	*	...	...	...	...
104	W.	K. M.	*	*	*	*	...
105	S.		*	...	*	...	...
106	S.	T. M.	...	...	...	**	**
107	A.	M.	*	*	...	...	...
108	W.		—*	*	*	—*	—*
109	W.	M.	*	*	*	*	...
110	W.		*	**	*	—*	—
111	W.	M.	*	*	...	**	**
112	W.		—	—*	...	—*	—*
113	S.		—*	*	...	...	*
114	L. W.	M.	—	...	*	...	*
115	L. W.		**	*	*	**	**

PEARS.

Note.—A number of the varieties of pears marked as approved in the different sections of the State are but of recent introduction, and as yet only tested by a few individuals; but the well known good qualities of the fruits elsewhere, and the excellence exhibited on a brief trial, seem to warrant their commendation. It is also quite probable that a large share of those marked as untested will be found, on trial, equally deserving of commendation.

Explanation.—The same columns and characters are used as for apples, (see p 27,) with the addition of the last right-hand column, in which Q stands for those varieties that are found to succeed best on the quince, (as *dwarfs*;) most of these, however, also do well as standards; but a few, marked S, are found unsuited for the quince, and are recommended only as standards. Those not designated have not been long enough tested on quince, or grow equally well on both kinds of stocks.

PEARS.

1. Ananas d'Ete, good as far as tested; said to be variable.
2. Andrews, little known; good where tested; on standard.
3. Bartlett, good every time; tree not very durable as a dwarf.
4. Belle Lucrative, excellent everywhere; best as standard.
5. Buerre Bosc, good only as standard; rather variable.
6. Buerre Clairgeau, beautiful and good; poor grower on quince.
7. Buerre d'Amanlis, profitable and good; especially North.
8. Buerre d'Anjou, universally approved; large and profitable.
9. Buerre d'Aremberg, sometimes good, but variable; poor on quince.
10. Buerre d'Brignais, or *Des Nonnes*, fair and productive; not first rate.
11. Buerre Diel, large and generally good, especially on the quince.
12. Buerre Easter, one of the best winter pears, if fully ripened; variable.
13. Buerre Giffard, excellent; tree of slender growth; best standard.
14. Buerre Golden of Bilboa, handsome and good; moderate grower.
15. Buerre Oswego, not fully tested; promises well.
16. Bloodgood, rather small, but excellent as standard; slender grower.
17. Bonne d'Ezee, productive and fair; not first rate.
18. Brandywine, vigorous and productive; very good.
19. Buffum, splendid grower; fruit good, but not first rate.
20. Cushing, a favorite with amateurs; not much known.
21. Dearborn's Seedling, small, but excellent; best as standard.
22. Dix, good fruit, but tardy bearer; won't thrive on quince.
23. Boyenne Boussock, worthy of general cultivation.
24. Doyenne d'Alencon, one of the best late pears; tree vigorous and productive.
25. Doyenne d'Ete, very productive and good.
26. Doyenne Gray, generally good in Ohio.
27. Doyenne White, or *Virgalieu;* very good in most parts of the West.
28. Duchesse d'Angouleme, large and profitable, especially as dwarf.
29. Duchesse d'Berri d'Ete, small, but handsome and good.
30. Duchesse d'Orleans, or *Buerre St. Nicholas;* very handsome and good.
31. Early Rousselet, very productive, and appears hardy; profitable; second rate.
32. Elizabeth (Manning's,) approved where known; rather small.
33. Figue d'Alencon, fine grower; profitable on quince.
34. Flemish Beauty, first rate generally, especially as standard.
35. Fulton, rather small, but good and productive; moderate grower.
36. Glout Morceau, excellent; rather late; not very productive.
37. Heathcot, handsome tree; very good.
38. Henry the Fourth, very productive and good sometimes; variable.
39. Howell, fine grower, and excellent, especially dwarf.
40. Jackson of N. H., little known; proves very good at Columbus.
41. Jackson's Elizabeth, productive, good, handsome.
42. Jalousie d'Fontenay, little known; very good sometimes.
43. Jaminette, not generally tested; very good winter.
44. Julienne, very productive, early and good.
45. Kingsessing, very hardy and good, as far as tested.
46. Kirtland, productive and fine, standard and dwarf; nearly first rate.
47. Lawrence, valuable winter fruit—one of the best.

	Season.	Uses.	N. Eastern.	N. Western.	Eastern.	Central.	Southern.	Dwarf or Std.
1	S.		*	*	*	*	*	
2	E. A.		*	*	...	*	*	
3	S.	M.	**	*	*	*	*	S.
4	E. A.	A.	*	*	*	*	*	Q.
5	A.		*	*	*	*	*	S.
6	L. A.	M.	*	...	*	*	*	
7	S.		—	...	*	—	*	Q.
8	L. A.	M.	**	*	*	**	*	Q.
9	E. W.		...	*	...	—	—*	S.
10	E. A.		...	—	*	...	*	Q.
11	L. A.	M.	**	**	*	*	*	Q.
12	W.	M.	—*	*	*	—*	*	Q.
13	E. S.		—*	—*	*	*	*	
14	E. A.		—*	—*	*	*	*	S.
15	A.		...	—	...	—*	—*	
16	S.		**	**	*	*	*	
17	A.		...	...	—	—*	*	
18	E. A.		—*	—*	...	*	*	Q.
19	A.		*	*	*	—*	—*	Q.
20	A.		...	...	...	...	*	
21	S.		*	*	*	*	*	Q.
22	A.		*	*	*	*	*	S.
23	E. A.	M.	**	*	**	*	*	
24	W.		*	*	*	*	...	Q.
25	E. S.		*	*	*	*	*	
26	A.		*	*	*	*	...	
27	A.	M.	—*	—*	*	*	—	Q.
28	L. A.	M.	*	**	*	*	—*	Q.
29	S.		...	...	*	*	*	
30	A.		**	*	...	*	*	
31	S.	M.	—	...	*	—	*	
32	S		...	...	*	...	...	
33	E. W.		...	...	...	*	*	Q.
34	A.	M.	**	**	**	*	*	S.
35	A.		*	...	...	...	...	
36	E. W.		—*	*	*	*	*	Q.
37	A.		...	...	...	...	*	
38	A.		...	—	*	—	—	Q.
39	A.	M.	...	*	*	*	...	Q.
40	A.		...	...	...	*	...	
41	A.		...	...	...	...	*	
42	A.		*	—	...	...	*	
43	W.		*	...	...	*	*	Q.
44	S.	M.	*	...	*	...	*	
45	A.		...	*	*	*	*	
46	E. A.		**	...	*	*	*	Q.
47	E. W.	M.	*	*	*	*	*	

PEARS.

48. Lycurgus, an Ohio seedling, resembling Seckel.
49. Louise Bonne de Jersey; fine grower, great bearer, and good fruit.
50. McLaughlin, highly commended where known.
51. Madelaine, one of the best early; good grower, as standard.
52. Napoleon, productive, juicy, vinous; not always good.
53. Noveau Poiteau, vigorous and productive; good if well ripened.
54. Onondaga, or *Swan's Orange;* large and productive; nearly first-rate.
55. Osband's Summer, productive and fair; soon decays when ripe.
56. Ott, one of the best; resemble's Seckel, and larger.
57. Passe Colmar, productive; very fine if well ripened; standard.
58. Rostiezer, good, high flavor; tree a straggling grower.
59. St. Ghislin, delicious, high flavor; slow in bearing.
60. St. Michael Archange, beautiful tree, and good fruit.
61. Seckel, very productive and popular, though small fruit and tree.
62. Sheldon, one of the best of American pears.
63. Stevens' Genesee, approved generally in Ohio; a little variable.
64. Summer Butter, of *Mears*, late in bearing; good, early.
65. Tyson, delicious; one of the best early pears.
66. Urbaniste, very good every where and every time.
67. Vicar of Winkfield, very productive; good, if well grown and ripened.
68. Washington, deserves to be better known; good, to very good.
69. Winter Nelis, very fine; winter.

REMARKS.—The past season having been unfavorable for pears and peaches in this State, but little alteration was made in the catalogue of these fruits, and very little discussion was had in regard to them by the Society. (For remarks on *pear blight*, &c., see a few pages onward in this report.) It is hoped that the coming season will be more favorable, and that the members of the Society will take pains to inform themselves in regard to the different varieties, so as to be prepared to revise the catalogue intelligently at the next annual meeting, which is to be held in Cincinnati. A catalogue of strawberries and grapes should also be made at that time.—SEC'Y.

	Season.	Uses.	N. Eastern.	N. Western.	Eastern.	Central.	Southern.	Dwarf or Std.
48	W.	A.	*	*	...	...	...	
49	A.	M.	**	**	*	*	*	Q.
50	L. A.		*	...	...	...	...	
51	E. S.		*	*	*	*	*	
52	A.		—*	*	...	—*	*	Q.
53	A.		*	—	...	...	*	Q.
54	A.	M.	*	**	*	*	*	
55	S.		—*	*	*	*	*	
56	L. S.		...	...	—*	*	...	
57	E. W.		—*	—	...	**	**	S.
58	S.		**	**	*	*	*	
59	E. A.		—	...	...	—*	*	
60	A.		—	—	*	*	*	Q.
61	A.		**	**	*	*	**	
62	A.	M.	*	**	**	**	*	S.
63	E. A.		—*	—*	*	*	*	
64	E. S.		...	...	...	...	*	
65	S.		**	**	*	*	**	
66	A.		*	...	*	*	*	Q.
67	E W.	M.	*	**	*	*	*	Q.
68	E. A.		*	—	*	*	*	
69	E. W.		*	**	*	**	**	S.

PEACHES.

EXPLANATIONS.—In the first column, headed *Class*, F stands for freestone, and C for cling. The second column indicates the color of the *flesh*; W for white, Y for yellow: other columns the same as for apples and pears.

1. Barnard's Yellow, very good and profitable; resembles No. 35.
2. Bergen's Yellow, one of the best yellow-fleshed—mid-season.
3. Coles' Early Red, generally good and profitable for market.
4. Columbia, much esteemed South, not so good North.
5. Cooledge's Favorite, very good and profitable for market.
6. Crawford's Early, everywhere counted best of all for market.
7. Crawford's Late, very popular, but not a great bearer.
8. Druid Hill, little known in Ohio; esteemed by some.
9. Early Newington, similar to *Large Early York;* not as profitable.
10. Early York (Serrate,) good, but variable, and tree too tender.
11. George the Fourth, one of the richest and best; not very productive.
12. Grand Admirable, large, late cling, similar to *Heath*.
13. Grosse Mignonne, excellent and universally approved.
14. Haine's Early Red, similar to *Large E. York*, and deemed identical.
15. Hale's Early, new, and best of all very early.
16. Heath Cling, best and most popular late cling.
17. Heath Free (not Kendrick's), productive and popular for preserving, etc.
18. Jacques, large, handsome, and good; resembles *Crawford's*.
19. Lagrange, late, and sometimes very good, but variable.
20. Large Early York, productive and good every where.
21. Lemon Cling, handsome and productive; rather sour.
22. Morris White, much approved by the ladies for preserving, etc.
23. Oldmixon Free, one of the largest and best; profitable.
24. Oldmixon Cling, best of all clings, and very productive.
25. Red Cheek Melcoton, old and reliable market variety.
26. Rodman's Cling, similar to No. 24; not so well known.
27. Scott's Nonpareil, popular in New Jersey; little known in Ohio.
28. Smock, very productive and profitable; late.
29. Snow, unique and generally good—for amateurs.
30. Stump the World, very popular where known; rather late.
31. Tippecanoe Cling, large, late; popular where known.
32. Troth's Early, very early, and generally good and profitable.
33. Ward's Late Free, good for a late variety; central and South.
34. Yellow Alberge, very productive and profitable for market.
35. Yellow Red Rareripe, similar to No. 1; very productive and profitable.

	Class.	Color.	Season.	N. Eastern.	N. Western.	Eastern.	Central.	Southern.
1..............	F.	Y.	M.	*	*	...	*	*
2..............	F.	Y.	M.	—*	—	...	*	*
3..............	F.	W.	E.	*	*	...	*	—*
4..............	F.	Y.	L.	*	—	*	—*	*
5..............	F.	W.	E.	*	*	*	**	*
6..............	F.	Y.	E.	*	**	*	*	*
7..............	F.	Y.	M.	*	**	*	*	*
8..............	F.	W.	L.	—	...	...	...	—*
9..............	F.	W.	E.	—	—	...	...	...
10..............	F.	W.	V. E.	—	*	*	—	—
11..............	F.	W.	E.	**	*	*	*	*
12..............	Cl.	W.	L.	*	...	...	...	*
13..............	F.	W.	E.	—	*	*	*	*
14..............	F.	W.	E.	...	...	...	*	...
15..............	F.	W.	V. E.	**	**	**	**	*
16..............	Cl.	W.	V. L.	—*	*	*	*	**
17..............	F.	W.	L.	—*	...	...	*	*
18..............	F.	Y.	M.	—*	*	*	*	*
19..............	F.	W.	V. L.	—	...	...	...	*
20..............	F.	W.	E.	*	*	*	**	*
21..............	Cl.	Y.	L.	*	*	*	—*	—*
22..............	F.	W.	M.	*	*	—*	—*	—
23..............	F.	W.	M.	**	**	*	**	*
24..............	Cl.	W.	M.	*	*	*	*	*
25..............	F.	Y.	M.	*	*	*	*	*
26..............	Cl.	W.	L.	...	...	...	*	*
27..............	F.	Y.	L.	*	...	...	*	...
28..............	F.	Y.	V. L.	*	*	*	*	*
29..............	F.	W.	M.	—	—	—*	—	—
30..............	F.	W,	M.	...	...	...	*	*
31..............	Cl.	Y.	L.	*	...	...	*	*
32..............	F.	W.	V. E.	*	...	*	*	*
33..............	F.	W.	V. L.	*	*	—	*	*
34..............	F.	Y.	E.	*	*	*	*	—
35..............	F.	Y.	E.	*	**	**	**	*

REPORT ON FRUITS EXHIBITED AT THE ANNUAL MEETING OF THE OHIO POMOLOGICAL SOCIETY.

The committee on Fruits Exhibited respectfully submit the following report:

We find on the tables a magnificent display of apples. A few varieties came from the central and eastern sections, but the large majority from the northeastern and northwestern portions of the State. The specimens from the two last named are remarkably fine, the northeast showing better than the northwest. Several new or unknown varieties are exhibited, of which the appropriate committees will doubtless take notice.

We find also a peculiarly fine display of winter pears, vastly superior, we think, to any that has ever before been presented to this body. The contribution from Messrs. Ellwanger & Barry, of Rochester, N. Y., consisting of thirty-five varieties, is especially deserving of notice for the beauty of the specimens and the number of new or rare kinds, which we think uncommon to the majority of western cultivators.

The specimens of varieties with which we are familiar are of a size and beauty that would indicate, either that the locality in which they were grown is better adapted to the pear than most of our Ohio soils and climate, or that the culture which they have received is superior to that we are in the habit of giving them.

Of grapes, we find on the tables six varieties from J. A. Brayton, one from Mr. Huntington, of Painesville; also one (and a bottle of Isabella wine) from Mr. Tryon, Willoughby, in a tolerable state of preservation. We append a list of the exhibiters of fruits and the varieties, as far as we are able to determine them.

J. R. Swan,
S. B. Marshall, } Com.
Giles Boalt,

Painesville, Dec. 15th, 1864.

Ellwanger & Barry, Rochester, N. Y., 35 varieties of winter pears; Geo. Powers, Perrysburgh, 15 varieties of apples and 4 of pears; J. Austin Scott, Toledo, 45 varieties of apples and 1 of pears; Chas. Pease, East Rockport, 4 varieties of apples; Simon Beiler, Zoar, 16 varieties of apples, (frozen); S. B. Marshall, Massillon, 1 variety of apples (Grimes' Golden Pippin); Miller, Swan & Layton, Springfield, 7 varieties of apples; C. W. Ensign, Madison, 26 varieties of apples; G. T. Cook, Madison, 5 varieties of apples; E. J. Ferris, Painesville, 6 varieties of apples; R. Marshall, Painesville, 12 varieties of apples; Storrs & Harrison, Painesville, 24 varieties of apples; Geo. W. Dean, Kent, Portage county, — varieties of apples; A. M. Hale, Mogadore, — varieties of apples; J. A. Brayton, Painesville, 6 varieties of grapes; J. H. Tryon, Willoughby, Isabella grapes and wine.

LIST OF THIRTY-FIVE VARIETIES OF WINTER PEARS FROM ELLWANGER AND BARRY.

Beurre Duhaume, Beurre Leon le Clerc, Beurre Gris de Hiver, Beurre Langlier, Beurre Diel, Beurre Easter, Bezi Sanspariel, Bezi d'Esperen, Bezi de Veterans, Black Worcester, Calebasse Delvigne, Cadette de Vaux, Columbia, Doyenne Goubault, Doyenne d'Alencon, Epine Dumas, Fortunee, Homewood, Josephine de Molines, Lawrence, Lamartine, Leon le Clerc de Laval, Messire Jean, Mignonne de Hiver, McLaughlin, Orange Bergamot, Reading Sugaret, St. Germain, St. Germain (Prince's), Stoeppert, Susette de Bavay, Vicar of Winkfield, Winter Nelis, Willermorz.

WINTER PEARS IN NEW YORK MARKET.

The Secretary read before the Society the following extracts from the letter of Messrs. Ellwanger & Barry, accompanying the box of pears:

"M. B. Bateham:—Agreeably to your request, we send you a few specimens of winter pears for the meeting of your Pomological Society. Some of the best varieties, such as Lawrence and Winter Nelis, are already mostly gone. They ripened this season about a month earlier than usual.

"We had some curiosity to find out what good, well-grown winter pears would sell for in New York: so we packed a few bushels each of Lawrence and Beurre Gris d'Hiver Noveau, and sent them to a commission house. The former sold for $16 per bushel, and the latter for $20.

"We have just finished planting a pear orchard of about six acres, mostly of late autumn and winter varieties, and hope to give a good account of it at some future time, if we are spared.

"The weather has been very mild until yesterday, when it became suddenly very cold. But for this, we should one of us have been present at your meeting.

Rochester, *N. Y.*, Dec. 8th, 1864."

Note.—The pears from Messrs. Ellwanger & Barry were so remarkably well kept that only a few of the varieties were ripe, and hence but little could be done toward forming any opinion of their merits as to quality. Such as were ripe were generally pronounced "very good," or "first-rate," but a few were only deemed valuable for cooking or preserving.

ON ENTOMOLOGY.

The Apple Moth.—A letter from Dr. J. P. Trimble, of New Jersey, on the subject of the *apple moth*, was read by the President, also drawin exhibited illustrating the depredations of this insect, and the means of prevention, &c. The letter was requested for publication, and here follows:

"NEWARK, N. J., Dec. 7, 1865.

"DR. WARDER, *Dear Sir:*—* * * * Since that pleasant meeting at Rochester, I have more inclination than ever to be amongst fruit growers. It is a pursuit that not only makes men useful and good, but delightful companions.

"I send you a rough sketch of my hay-rope trap for the larva of the apple moth. The tree represented is 10 inches in diameter, requiring 8 or 9 feet of rope. This trap caught nearly 200 of the worms this season. The coil, as represented in the picture, has been slipped up a few inches, and shows the marks where the worms were situated. But two have been found under the scales of bark on that tree outside of the trap, though plenty are seen on all neighboring trees. *I believe it will do.* Although hay is high now, as our friend J. J. Thomas said, there is nothing else that will answer the purpose so cheaply.

"Please have your Ohio fruit growers give it a fair trial next year. It should be applied about the first of July; slip it up every two weeks and kill, then push down till moderately tight. Remember the early worms become moths and produce a second crop. I send also some of the scales of bark with the cocoons and larvæ, and some pierced with holes, where the little woodpecker had found them. This is not the sapsucker that makes those rows of holes, as in another specimen I send, and so often found in apple and other trees.

"When at Rochester I could not tell you how this bird found the caterpillar; but I have been watching him since—it is not by smell, or instinct, but by *sounding.* As you Doctors would say, by *percussion,* when you try to find out the condition of the lungs. He finds a scale that looks likely; tap-tap-tap, three times quick—then moves down backwards or sidewise, or up, no matter which, every motion seems equally easy and rapid; another scale is tried—and another. In a little while he has been over the tree; and then off to another. I have found this caterpillar (five in number) in the stomach of the little chickadee, but I do not believe that it finds them as the woodpecker does. After a long rain a sudden change of wind will make a great change in the temperature; the expanded bark suddenly contracts—it warps as seen on the buttonwood, shell-bark hickory, etc., that breaks up the cocoon and exposes the caterpillar to the watchful eye of this busy little bird. It has only been in such weather that I have found such food in the crop of the chickadee. These birds, and perhaps others, to assist us—or rather, if we will assist them, by using this hay-rope trap or something else, will enable us to control this terrible enemy of the apples and pears.

"Try if you cannot prevail upon the gentlemen at Painesville to form neighborhood clubs that will, for two years at least, give this a fair trial. If your fruits in the West suffer as they do here, something must be done, and soon too, or 'all we have left will be empty talk of old achievements and despair of new.' (There, I have tried to quote from some old poet, but poetry about *worms* don't seem to come in smoothly.) These clubs must not confine their attention exclusively to the apple moth enemy; the curculio, the borers, tent caterpillars, etc., must all be understood and battled with to extermination."

NOTE—Since the time of the annual meeting Dr. Trimble has published a handsome volume on the apple moth and the curculio, with illustrations; a work of much value to fruit growers, costing $5, free of postage. Address Wm. Wood & Co., Walker St., New York.

In the address of President Walker allusion is made to the labors of Townsend Glover at Washington, in illustrating the subject of entomology as affecting horticulture and agriculture, and the following resolution was adopted by the Society:

"*Resolved*, That we feel the importance of entomology to horticulture and agriculture, and that we have seen with pleasure portions of the work of Mr. Townsend Glover, as exhibited at this meeting; and we do hope that Congress will, at an early day, make a liberal appropriation for the presentation of this work to the farmers our country."

ON THE CLIMATE OF THE LAKE SHORE.

Mr. Bateham expressed a desire to hear some remarks from Dr. Kirtland on the influence of the Lake as affecting the climate along the shore, in reference to fruit growing. He was of the opinion that this subject was far from being generally understood. It may be found that the *humidity of the atmosphere*, or the absence of that aridity which often prevails for weeks together in the interior of the State, was one cause of the superior quality of the fruit along the lake shore. He thought there was need of better instruments *(hydrometers)* for making observations on the state of the atmosphere with reference to moisture.

Dr. Kirtland, in reply, spoke of the absence of *fogs*, or their rare occurrence along the lake shore; and the comparative scarcity of dews, especially in the latter part of summer, not however as indicating peculiar *dryness* of the atmosphere, but a more equable state of its humidity; and less extreme variations of temperature of the day and the night.

The comparative exemption of the lake shore from untimely frosts, was no doubt owing to the temperature of the water, modifying that of the atmosphere in its vicinity. At a distance of five or ten miles in the interior, there usually occurs one or more killing frosts about the 25th to 30th of September, while along the lake shore none such occur till about the last week of October; giving a whole month longer season. The winter temperature of the body of water in Lake Erie is about 40° to 42°, while that of the air over the shore may be zero. This is apt to give rise to a movement of air or current of wind from the shore towards the centre of the lake; then, becoming warmer and rising upwards, it flows back towards the land at a higher elevation, and, mingling with the colder air, changes the temperature along the shore for a greater or less distance inland, and most sensibly affecting the *more elevated* locations, as had been repeatedly shown by observation with the thermometer.

In spring the ice in the lake, and the coldness of the water afterwards from ice in the upper lakes, usually so affects the temperature along shore, that vegetation does not start as early as more inland; and people coming here from Cincinnati and Columbus speak of the fruit trees in blossom and salad and cucumbers on the tables there, while we have scarcely un to show signs of spring. But often, in return for this, our friends in the southern and central parts of the State are called to lament the loss their fine prospects, by the visit of a destructive frost, from which we are exempt. When the ice is all gone from the lake and the water a few rods from shore has risen to the temperature of 42° vegetation begins to put forward rapidly, and it is very seldom that frosts occur to injure the tenderest plants.

Mr. Bateham remarked that, since his residence at Painesville, he had often observed that when the evening was clear and cool, and every thing promising a sharp frost before morning, he has found that during the night the temperature has risen, so that instead of a frost the next morning it was actually warmer than at bedtime. He thought it was a great advantage to that portion of the lake shore, that owing to the form of the lake the prevalent winds, from the west, come over a large extent of the lake. He was somewhat puzzled, however, to account for the damage done in that region to the fruit buds by the cold snap of last January (1864).

Dr. Kirtland remarked that there were occasional instances of severe cold weather which did not come from the north nor even the west, but seemed to descend upon the country from the heights of the Rocky Mountains and the great plains in the South-west. This was the case at the time referred to, last January. The wind being from the southwest did not come to us over the waters of the lake, and hence its severity was not modified by the temperature of the water.

REMARKS ON PEAR BLIGHT, AND OTHER DISEASES OF FRUIT TREES—THEIR CAUSE AND CURE.

At the request of the Society, Dr. Kirtland occupied some time in remarks of a very interesting character, on the subject of pear tree blight, leaf curl in peach trees, &c.; ascribing these maladies, and various diseases of the human system, to cryptogamous vegetation—the operation of microscopic fungi. At the request of the Secretary, Dr. K. furnished the following abstract of his remarks on these subjects, for publication:

"The disease known as the Blight or the Fire-Blight, is at this day proving the most serious obstacle to the successful cultivation of the pear, in many sections of the country. Early in the present century it prevailed extensively in New England, coincidently with the spotted fever, and other disorders of a low grade of action, which at that period swept epidemically over that region of country. It was a popular opinion that all these diseases, both of the human family and vegetable kingdom, arose from one cause;—an opinion not, however, tolerated by medical men and men of science in that day.

"Various theories have been advanced to account for the origin of this blight. Insects, frozen sap, electricity, excessive evaporation, and exhaustion of the soil, have, at different times, been assigned as the cause. Investigation of each fails to meet and explain the phenomena attendant on the rise, progress and results of that disease. It is time they all should be abandoned, and that researches for a cause be extended in some other direction.

"As a starting point in this undertaking, I will suggest another hypothesis, which may perhaps explain the pathology of the blight, and call into use an effectual remedy or preventive. *Pathology*, Dr. Webster defines to be 'the doctrine of the causes and nature of diseases.'

"1. The Pear-tree Blight is produced by the poisonous impression of the seeds *(sporules)* of a microscopic fungus.

"2. Several combinations of iron, especially the sulphate *(copperas)*, will, to some extent, counteract that impression.

"It will be understood that these two propositions are merely hypothetical. If sustained by analogies, subsequent observations, and experience, they will be accepted as truths; if not thus sustained, they will, of course, be rejected.

"The extensive prevalence of the cholera, over large portions of the globe, commencing in the year 1818, led medical men to seek for its cause. Dr. Cowdell of London, in 1848, published 'A Disquisition on Pestilential Cholera, being an attempt to explain its phenomena, nature, cause, prevention and treatment, by reference to an extrinsic fungus origin.'

"In 1849 Prof. J. K. Mitchell, of Philadelphia, issued a more elaborate work, 'On the Cryptogamous Origin of Malarious and Epidemic Fevers.' It abounds in numerous facts and correct reasoning, and should be consulted by every investigator of disease, animal and vegetable.

"These publications attracted the attention of the medical profession, both in America and Europe, so long as that epidemic continued its ravages, and the theories they advanced gained extensive credence during that time. They were, however, lost sight of when that epidemic subsided. Recently they have been substantiated as plain matters of fact, so far as malarious diseases are concerned, by the labors and investigations of Prof. J. H. Salisbury, of Cleveland. In due time the public will be favored from his own pen with an account of his interesting and important discoveries. [See Ohio Agricultural Report, 1863.] I will only add in regard to them, the assertion that the cause of fever and ague is no longer a questionable subject. He has not only detected, figured and described with minute accuracy and beauty the species of fungus which produces that disease, but has propagated and cultivated the plant within doors to an extent sufficient to contaminate the atmosphere of the apartments, and induce attacks of that disease among the inmates. His labors have also demonstrated that measles are of a cryptogamous origin, and it has long been known that *Favus*, a disease of the human skin, *Muscardine*, a disease of the silk-worm, and a fungoid growth from the larva of the Melolontha or May bug, are of a vegetable nature.

"It is well established, then, that a number of diseases of the animal system are produced by fungi. 'Under this name botanists comprehend not only the various races of mushrooms, toadstools, and similar productions, but a large number of microscopic plants, forming the appearances called mouldiness, mildew, smut, rust, brand, dry rot, &c.' They are universally diffused in nature. It is difficult to conceive of a place where they do not exist. They are among the most numerous of all plants, in regard to genera and species, and with very few exceptions are deleterious in their impressions on the animal system. Even the palatable mushroom is always poisonous to some persons, and may become so to all under certain circumstances. It is equally evident that they frequently occasion diseases in the vegetable kingdom. The smut of wheat and maize, the rust of wheat, ergot of rye and grass-seeds, and specks, cracks and discoloration of the skin of the apple and pear are of this nature.

"The microscopical examinations of Prof. Salisbury and others have detected the presence of certain species, infesting extensively pear trees about the period of attack by the blight. They have made similar discoveries that lead to the conclusion that the curl of the peach leaf, the potato disease, and the blight of pear trees, all have their origin from the cause assigned in my second proposition.

"Under this head still another disease of our fruit should be noticed. I have watched carefully the sudden and premature decay of our plum crop, at the period of its ripening, for the last fifteen years. From hints afforded by the work of Professor Mitchell and several microscopic observations of my own, I was induced to publish an article in The Florist of Philadelphia, in the year 1855, in which I imputed the origin of the disease to the Torula or some analagous species of parasitic fungi. That article was subsequently republished in the Ohio Farmer at Cleveland. The disease still prevails among us, and it is sure to destroy all the plums which escape puncture by the curculio. It is, however, generally overlooked by pomologists, and its effects are charged to the depredations of that insect. Similar disease occasionally impair our peach and apple crops, to a less extent. Whenever it occurs on either of these varieties of fruit, the spurs and young wood blight or canker and cease to be fruitful for several years.

"If these discoveries and analogies establish, with any degree of certainty, the hypothesis of the cryptogamous origin of the pear tree blight, we have made important progress in laying down true indications for its cure or prevention. Among the means suggested for effecting that end certain combinations of iron have already been named. The authority for such practice is founded on the following facts:

"1 It is a popular belief that iron exerts a favorable influence over the health of fruit trees. Hence arises the practice of driving nails into the body of such trees and loading their limbs with scraps of iron. Both the belief and the practice may be visionary, yet in such instances of popular belief investigation usually discovers them to be founded on some shadow of truth.

"2. An intelligent and observing gentleman of Cleveland informs me that he prevents the curl of the peach leaf by depositing in the earth, about the bodies of the trees, fragments of rusty stove pipe and worthless pieces of iron.

"2. Twenty-four years since I called the attention of the public to the isolated fact without reference to any theory, that a large pear tree in Columbiana county, Ohio, with its body surrounded with many wagon loads of boulders, scoria, scales of iron and accumulations from a blacksmith shop, retained its health, vigor and fruitfulness, while all other pear trees in that region of country, had either died, or were suffering from blight. *Vide* New England Farmer, December 3d, 1840, page 153. At this late day this tree still continues healthy.

"4. I recollect reading in that reliable journal, Hovey's Magazine of Horticulture, some years since, a statement that the finest prize pears seen in the Parisian market, were produced by investing the growing fruits with folds of cotton or linen cloth, and daily, or oftener, moistening them with a solution of sulphate of iron. This treatment was said to result in developing the size, beauty and quality of the fruits to a high degree and especially to free them from parasitic blotches.

"5. Four years since Mrs. Weller Dean of Rockport, Ohio, informed me that blight might not only be prevented in healthy pear trees, but might be successfully arrested, in many trees, after it had made considerable progress, by means of repeatedly washing the bodies of the trees with a saturated solution of sulphate of iron (copperas) at a time when the sap is in active circulation.

"This was a confidential communication, with the condition annexed that I should thoroughly test the plan, and if it should prove successful I was to publish it, and furthermore, if any merit or more substantial reward should be deemed due to any one by the public, she was to be the recipient.

"This plan has yet been only imperfectly tried. Age and infirmities will probably prevent its completion by me. I will therefore report that I have tested it on a number of my partially blighted pear trees, while a greater number has been left to die unmedicated. Of the former not one has yet perished, while of the latter very few survive. It has appeared, in every instance, to arrest the progress of the disease, and to impart a healthy condition to the bark wherever applied. The apparent results may have been coincidences and not the effect of the remedy. There is much false experience in horticulture and agriculture, as well as in medicine.

"These views suggest the expediency of extensively applying a solution of the sulphate of iron by means of a green-house syringe or garden engine to the tops and foliage of trees laboring under any of the diseases suspected of a cryptogamous origin. It also becomes a query whether the same agent may not be successfully employed at some period to counteract the potatoe disease, either by watering with it the growing plant or washing the tubers in it in autumn after they are dug. No injury has ever arisen to pear trees by a free use of a *saturated* solution of copperas.

"In conclusion I would observe that the discovery of the cryptogamous origin of the many disorders of the human system is effecting important changes in their treatment. May we not hope that an extension of these discoveries to the vegetable kingdom may result equally favorable in shaping the practice in diseases of fruits and fruit trees?"

Mr. Bateham expressed the deep interest he felt in these remarks of Dr. Kirtland, and the hope that members of the Society would follow up these investigations with such experiments as would, in a very few years, test the correctness of the theories. He informed the Society that the researches of Dr. Salisbury, so justly commended by Dr. K., would be found with illustrations in the report of the Ohio State Board of Agriculture for 1863, just published, and he felt that the thanks of this Society and of Pomologists generally were due to Dr. Salisbury for his valuable contributions to our scientific literature.

HOW DR. KIRTLAND RAISED HIS NEW SEEDLING CHERRIES.

In speaking of hybridizing fruits or raising new varieties from seed, Dr. Kirtland said a full stock of *patience* was needed. Being asked to give some account of the manner in which he was so successful in producing improved varieties of cherries, he said he commenced experimenting with cherries as long ago as 1812, and picked the first good fruit from his seedlings in 1845. He did not, however, intend to assert that so long a period of experimenting was necessary.

He first took the seeds of the best cherries he could find, and raised seedlings from them, without any good results. He then planted trees in a close group, consisting of Yellow Spanish (W. Bigarreau) Black Heart, May Duke, Black Mazzard, and one or two others, so as to secure the cross-fertilization of the blossoms by the agency of bees, &c., and from the seeds of these trees he raised about five thousand seedling trees. From these he selected only the most promising in foliage and growth—about ten per cent., or five hundred trees—which he planted for fruit, and not over ten per cent. of these were of any value—fewer still deserving of name and propagation.

Dr. K. said he had never practiced artificial cross-fertilization of cherry blossoms, as is now done with grapes and other fruits, but he had no doubt it could be done. Professor Lindley had denied that the Duke and Morello cherries would hybridize, but he was convinced it had been done on his own grounds. The Rogers Grapes, also, he had no doubt, were true hybrids. He believed that many fruits could also be improved by raising successive generations from seed, of one variety alone, as the common Morello cherry, so as to break its native habit by cultivation.

Several gentlemen present spoke of the favorable effects of iron and of sulphur, applied to fruit trees, and some had already tested, with good results, the use of *copperas* (sulphate of iron). Mr. Elliott said a few years ago he had a choice plum tree well set with fruit, more than half grown, when all at once it began to droop and to cast its leaves. He was anxious to save some of the fruit, as well as the tree, being a new sort. Accordingly he purchased a pound of copperas and dissolved it in two or three buckets of water, then made a trench around the tree and poured in the solution where it would be likely to reach the roots, at the same time sprinkling some over the top. The tree revived and matured its fruit. He afterwards used copperas water as a remedy for leaf blight, on seedling pear stocks, with success. [A good hint for nurserymen.—*Sec'y.*]

THE SOCIAL FESTIVAL.

On Wednesday evening a Social Entertainment was given by the citizens of Painesville to the members of the Pomological Society and other visitors, which was a very pleasant affair, and will be long remembered by those who were the guests of the occasion. The number who sat down to the well filled tables was nearly two hundred, taxing to its utmost capacity the spacious dining hall and reception room of the Cowles House. After ample justice was done to the bountiful supply of tasteful viands, a feast of reason, wit and mirth began, and continued for several hours.

Mayor Steele, as Chairman, introduced these exercises by a well timed little speech complimenting the President and members of the Pomological Society, and welcoming them to the village and to the hospitality of its citizens. He closed with the following sentiment:

Our Guests—We know them by their *fruits*, and we tender to them a cordial welcome and the right hand of fellowship.

This was responded to by Dr. Warder, as President of the Pomological Society, in his usual happy vein, complimenting the place and the people, and closing with the sentiment:

The Village of Painesville—Highly favored by nature in its location, and distinguished for the intelligence, enterprise and hospitality of its citizens, and their devotion to the interests of education.

Responded to by Dr. Beardslee, giving some account of the Lake Erie Female Seminary and the public schools of Painesville, and closing with the sentiment:

The State of Ohio—Central in the great sisterhood of States, and mighty in her internal resources, the crown and glory of the Republic.

Responded to by Hon. B. Bissel in an eloquent and patriotic speech on the position and greatness of the State, and especially the valor and achievements of her sons in the war for the Union. He gave as the next sentiment:

Our Soldiers and Sailors—All honor to the brave men who, in defense of our country, interpose a living wall between us and treason.

Responded to by Hon. S. S. Osborn in terms befitting the sentiment and the occasion. The next toast was:

The Agricultural Press—Chief among the instrumentalities for improvement in Agriculture and Horticulture.

Responded to by S. D. Harris, of *The Ohio Farmer*, in a brief speech full of sentiment and humor. Then came:

The Ohio State Board of Agriculture—The representative of the great industrial interests of the State, it justly stands in the front rank of improvement.

Responded to by W. F. Greer, the resident member of the Board.

The next came from the Pomological Society:

Dr. J. P. Kirtland, the "Cherry King" and Pioneer Horticulturist of Northern Ohio—May we long have the benefit of his valuable teachings among us.

Responded to by Dr. Kirtland, who gave some very interesting reminiscences of his early travels and observations along the lake shore.

Mayor Steele offered this:

The Worthy Secretary and Treasurer of the Ohio Pomological Society—We greet him as a valuable accession to our community.

Responded to by M. B. Bateham, giving some of the reasons for his change of base from Columbus to Painesville; and he paid off his Honor by giving the following:

The Mayor of Painesville—A blade of true *Steel*, well tempered and polished; may he never grow rusty.

Responded to by Mr. Steele. Then Col. Harris offered the following:

Woman's Sphere—Not circumscribed by kitchen walls, but extending to the surroundings of the homestead, and particularly to the garden.

Col. E. Spencer, "The Tall Chief of the Geaugas," was called upon to respond to this on behalf of Mrs. S., the mistress of both the house and garden.

The following were offered by members of the Pomological Society:

Our Sister Societies in the West—With whom we cordially reciprocate the best wishes for their success, and whose sympathy and co-operation we claim as tributes to our seniority.

Responded to by Mr. Beeler, of Indiana.

Horticultural Ichthyology—The Fishes of Lake Erie, and particularly the *Pikes* of Lake county—an elegant game fish, delighting in the luxuriance of productive *Banks* and under the umbrageous foliage of the *White Willows*.

Responded to by E. S. Pike.

The Nurserymen of Western New York—Deserving the good will and benediction of the lovers of good fruit throughout all the land.

Responded to by Mr. Bronson, of Geneva, New York.

The Delegates from Toledo—We remember their hospitality of last year, but shall not let them go *Scott* free on this occasion.

Mr. Scott, in responding to this sentiment, said that the citizens of Toledo were more than compensated for their efforts to make the visit of the Society to that place agreeable the past year, and he was instructed to invite them to come again at an early day, with the assurance that the people there would do better for them than before.

The Ladies—Always charming—never more so than to-night.

Responded to by Col. Montgomery, late of Vicksburgh, who made decidedly the most effective speech of the evening, sending the company to their homes in the happiest mood, though with aching sides and many missing buttons.

Concluding toast:

Our Landlord and Landlady—We are glad to accord them the highest credit for the feast prepared for us, and we hope they will realize as valuable *Gaines* as we have.

ELECTION OF OFFICERS.

The Committee on Elections made the following recommendation of officers for the ensuing year:

For President—Dr. J. A. WARDER, of Cincinnati.

For Vice-President—G. W. CAMPBELL, of Delaware.

For Secretary and Treasurer—M. B. BATEHAM, of Painesville.

Committee Ad-Interim—S. B. Marshall, Massillon; F. R. Elliott, Cleveland; J. R. Miller, Springfield; and Geo. Powers, Perrysburgh, with the above officers.

The report of the Committee was confirmed by the Society, and the officers recommended were elected.

AD-INTERIM COMMITTEE.

A Committee appointed for the purpose, reported the following:

The Ad-Interim Committee of this Society are expected to meet from time to time as they may deem best, at such places as may promise objects of interest in fruits or plans of culture, &c., as promise to be useful to the Society. The Committee, being scattered, will observe the condition of the fruit crop in their several localities, and be prepared to report to the Society, at the annual meeting, the result of their observations on various matters connected with their pursuits. Members and citizens generally are requested to communicate freely with any one of this Committee all new facts that may come under their notice, and to forward to them specimens of new and valuable fruits, that they may be properly examined and brought before the Society and the public.

STATE APPROPRIATION.

The President, from the Committee appointed last year to petition the Legislature for a small appropriation to defray the expenses of the Committee Ad-Interim, reported that they had attended to the duty, and the Legislature had granted to the Society an appropriation of $300 per year.

FRUIT DEPARTMENT OF THE STATE FAIR.

Mr. W. F. Greer, on behalf of the Ohio State Board of Agriculture, requested the Society to adopt some measures by which the Board of Agriculture might have the benefit of the advice and assistance of this Society in the management of the Fruit Department of the State Fairs, in order to secure, if possible, greater interest and usefulness in that department. Mr. G. said he had expected that both the President and Secretary of the State Board would have attended at this meeting to present the subject more definitely. In their absence he was not prepared to suggest any definite plan of co-operation, further than that a Committee might be appointed to meet with the Board at the time of making its schedule of premiums, etc.

After some discussion, such Committee was appointed, consisting of Dr. J. A. Warder, Geo. W. Campbell and M. B. Bateham.

This Committee met with the State Board at Columbus, March 14th, when a liberal schedule of premiums on fruits and flowers was made out, and suitable persons were appointed to serve on the Awarding Committees. The Committee of the Pomological Society agreed to do all in their power to assist the State Board in promoting the interest and success of this department of the State Fair, and they would use their influence to secure the hearty co-operation of the members of the Society in that object; but they had no authority to act for the Society, as such, nor to assume any responsibility in the matter, except as fruit growers and citizens feeling deeply interested in the promotion of the great objects which the State Board and Pomological Society are both striving to promote.

RESOLUTION OF THANKS.

The following resolutions were unanimously adopted by the Society, near the close of the meeting:

Resolved, That the thanks of the Society are hereby tendered to Dr. J. P. Kirtland, for the very instructive remarks with which he has favored us during this meeting, upon blight and other diseases of fruit trees, the climate of the Lake Shore, and the raising of new varieties of cherries and other fruits from seed.

Resolved, That the thanks of the Society are tendered to the President and Secretary for the manner in which they have performed their duties at this meeting and the past year.

Resolved, That our thanks are pre-eminently due to the citizens of Painesville for the cordial hospitality extended to us—and to Mr. Wilcox for the gratuitous use of his hall during this meeting.

Resolved, That we recommend *The Ohio Farmer* to the patronage of all, as the best exponent of Agriculture and Horticulture in Ohio.

FOR A GRAPE GROWERS' ASSOCIATION.

Mr. Elliott submitted a proposition—which was favorably regarded by those present—to form an Association to be called the Ohio, or the Northern Ohio Grape Growers' Association, as shall be decided at the first meeting—the object to be the gathering and collating and publishing of information relative to all matters pertaining to the Grape Vine, its fruits, uses, &c. Meetings to be held quarterly, or oftener, at different points, as the Society shall determine, and an exhibition of grapes and wine annually. All persons interested in this subject and willing to become members, are requested to send their names to F. R. Elliott, Cleveland, Ohio.

The Society has since been organized:

Dr. J. P. KIRTLAND, *President;* M. B. Bateham, *Vice-President;* Dr. J. P. DUKE and F. R. ELLIOTT, *Secretaries.*

A meeting is called, to be held at Cleveland on the 21st of June, to make arrangements for the season.

PLACE OF NEXT ANNUAL MEETING.

Dr. Warder proposed Cincinnati as the place for the next annual meeting of the Pomological Society; Mr. Hall proposed Toledo; and Dr. Miller Springfield. The Society voted to go to Cincinnati in December next, the day to be fixed by the Committee.

REPORT OF THE AD INTERIM COMMITTEE.

ON STRAWBERRIES AND THEIR CULTURE.

In May the Committee met at Cincinnati to examine the great strawberry fields of that region. Some of these were visited, particularly on the Kentucky hills, where the old-fashioned method of cultivating this delicious fruit was exhibited. We cannot report favorably upon what we saw of this method. Though it has furnished large results in the grand aggregate of production, the greater produce of the modern methods of more scientific management has caused good cultivators to look with disfavor upon the old plan of field culture.

As a matter of historic interest, however, we have concluded to give a brief outline of the primitive method, which has long been pursued, and has enriched many a cultivator with its results, that were attended with a liberal remuneration by the production of immense quantities of fruit.

A piece of rich land, so heavily timbered as to be free from grass, weeds, and undergrowth, was selected, cleared and broken up. In the spring of the year it was planted with strawberries, in rows three or four feet apart; corn was frequently put into the same rows, and some cultivation was given through the summer, which encouraged the growth of the plants and the production of runners. In the fall the corn was harvested, and any large weeds were cut down.

The next season a fair crop of very fine fruit was gathered, and the runners were allowed to spread over the ground. In some cases a single cultivation was given in the spring. As the weeds made their appearance they were cut down with a scythe and left upon the ground, and by the end of summer the runners would have covered the surface completely, so that the field was well stocked with strawberry plants, and the next crop was a heavy one, except where the plants had become too thickly set. After this the increase of runners would soon make the patch too thick, and some measures were necessary to reduce their numbers. A heavy harrow dragged over the field when the ground was soft, was the means commonly used for thinning the crop, and this treatment was generally followed by another heavy yield of fruit. After this the crops were found to be lighter; the plants being thus crowded together could not be so productive, and by this time the natural growth of blue-grass and white clover was found to make rapid inroads upon the strawberries, and the fruit diminished in value, so that it was considered more profitable to break up the ground and apply it to other crops. Some would allow the strawberries to remain struggling for supremacy a few years longer, and would continue to gather light crops of fruit from among the grass, until it was no longer doubtful which was the legitimate occupant of the soil.

Those who planted in older cultivated fields pursued a similar course, but generally experienced still greater difficulty with the grasses and weeds than on new lands freshly reclaimed from the forests, and consequently found an earlier deterioration of the strawberry fields. In some cases this difficulty has been obviated in a great degree by trenching the soil, as is usual for vineyard planting; by this means the surface mold, with its multitude of weed seeds, is buried so deeply that they cannot vegetate, and the lower stratum, which contains no weeds, is brought to the top. Planted in the rich tenacious limestone clays prepared in this manner, the strawberries root deeply, withstand the drought, grow strongly, and bear the most abundant and magnificent fruit; but the expense of trenching is so great that it is seldom practiced for the strawberry, and the vine-dresser objects to the occupancy of the ground among his grapes by any other crop, at least after the first year.

The "strawberry theory," as it has been called, is the explanation of the great success for which the Cincinnati growers have for years been noted. It need not be repeated to the members of this Society, who are all familiar with the fact that the *practice*, rather than *theory*, depends upon the observation by Mr. Longworth, that the most successful strawberry grower of the neighborhood depended upon the use of plants that were purely pistillate in their inflorescence, and that the majority of varieties, including all the most celebrated imported sorts, though apparently perfect in their flowers, were really defective in their impregnation, probably on account of abortive pistils, and failed to produce more than ten per cent. of well-developed fruit, which, however, was often very large and highly flavored, so that where fine specimens were desired, these comparatively infertile sorts would bear the palm as prize strawberries.

The famous Hovey's Seedling was one of the most celebrated of the pistillate varieties, but several others of this class were found and largely cultivated in this neighborhood, as it was deemed to be a great desideratum to have every blossom producing a well-developed fruit. Of course stamen-bearing varieties were planted in proximity to the pistillates to insure their impregnation. The statements with regard to these peculiarities of inflorescence were treated with ridicule by botanists and horticulturist every where, for the normal character of the Frazier and of the whole rosacean order, is that of perfect flowers, and only a small percentage of seedlings are pistillate; but the dogged perseverance of the Cincinnati gardeners who had observed a positive fact, sustained them in the support of their "theory," and in the pursuit of the practice, they have not only reaped a rich reward, but have abundantly supplied the city market with hundreds of bushels daily for weeks of the season, and have furnished them at prices which enabled the poorest inhabitants to enjoy this healthful fruit in their families. When other towns reported by quarts they spoke of bushels.

As these acute observers continued their studies of the peculiarities of the strawberry, an occasional rare variety was found that appeared to have all of its flowers perfect in both set of organs—these were styled Hermaphrodites, and were highly valued as impregnators of the pistillate varieties, which were unable to produce any fruit when planted alone. The Longworth Prolific was the first of these produced among many thousands of seedlings raised with a view of obtaining new and improved varieties. Willson's Albany, now so popular in the market, is another; but this class of true hermaphrodite strawberry plants is still quite limited, and the perfect flower in the strawberry continues to be the exception.

The Committee also visited several places where garden culture was practiced, and they found a great number of varieties that were being tested; some of these were new and quite promising, but nothing of superior excellence was presented for them to report upon to the Society. One of the committee still has a high regard for the Extra Red, one of the Langworth seedlings; it is pistillate, and of great productiveness, with handsome shape, bright scarlet color, and a fine brisk, acid flavor. Though not new, this variety does not appear to have attracted deserved attention, and perhaps it is rather too delicate for a good market fruit; one reason of its unpopularity in certain quarters has arisen from the fact of a very sour and exceedingly productive variety, the No. 1, having been confounded with it. The same member also speaks very favorably of the

Mote Seedling, which originated at West Milton, Miami county, O. This is also a pistillate variety, vigorous and productive. The fruit is large, well formed, and of a beautiful color; flesh creamy, high flavored, and very good. Its parentage is Langworth's Prolific crossed on Burr's New Pine. Several other new varieties were seen, but as they were found in greater perfection elsewhere, a notice of them will be deferred to another section of this report.

[An account of the visit of the Committee to the famous fruit farm of Mr. Knox, at Pittsburgh, with notes on his varieties of strawberries, mode of culture, &c., from the pen of Dr. Warder, was intended for insertion here, but by some accident or oversight was not received in time by the printers. It may be inserted in a subsequent part of this report, if received in time.]

STRAWBERRIES AT SPRINGFIELD.

Some of the Committee, visiting Springfield, found a fair show of strawberries on the grounds of several citizens there, and the Nursery of Miller, Swan & Layton, grown mostly for home use; the soil a good, substantial loam, on limestone gravel; the varieties most approved were Wilson's Albany and Scott's Seedling; Triumph de Gand is good, but not profitable; Hooker and Burr's Pine were popular with some amateurs for the sake of fine flavor, and Early Scarlet for its earliness and productiveness, though wanting in size.

AT COLUMBUS.

The Committee found a large number of sorts of strawberries at the Columbus Nursery, grown for the plants and for experiment. The following are only a few of the more prominent ones, with the results as far as tested, on strong soil, dark clayey loam, clay subsoil, the crop often subject to injury by drouth:

Wilson's Albany is put first in productiveness and profit for market, but the fruit is not best in quality, and is liable to injury from dirt, owing to shortness of fruit stalks. The beds, too, need renewing oftener than most other varieties, the plants soon dying out from overbearing and effects of drouth.

Longworth's Prolific, McAvoy's Superior and Extra Red—These have been grown and approved here for quite a number of years, the plants being more vigorous in root and leaf, and better able to withstand hot sun and drouth than the foreign and Eastern varieties. With proper culture, the proprietors thought these were as profitable as any for that soil and climate.

Hovey's Seedling and some of the most promising of Prince's Flushing varieties had been found quite unworthy of culture here.

Hooker and Burr's New Pine had been mostly discarded, owing to their want of ability to withstand heat and drouth, and their comparative unproductiveness, though there was naturally some call for the plants from amateurs.

Triumph de Gand, with good culture, was a fine, large berry, and produced well; plants quite saleable.

Russell's Prolific was on trial, and seemed to be a vigorous grower as well as productive, promising well.

Austin, or Shaker, did not meet the expectations of the public; fruit large, but has no other recommendation.

For market, the gardeners around Columbus, after trying a number of other sorts, have mostly adopted Wilson's Albany, to the exclusion of all others.

FOR RASPBERRIES, the soil around Columbus is not at all suitable generally, and but few are grown for the market, chiefly the Black Cap variety, with a few of the Purple Cone and varieties of American Red. In private gardens, and at the Nursery, a number of finer varieties are to be found, but only in small numbers, and not affording much returns.

AT DELAWARE.

In the grounds of G. W. Campbell we found good beds of strawberries, consisting of Russell's Prolific and Buffalo Seedling; their first year; promising finely. Austin, or Shaker, and Burr's Pine doing better than at Columbus, the soil seeming deeper and less affected by drouth.

STRAWBERRIES AT CLEVELAND.

We found the Cleveland market well supplied with strawberries, many of them of finer appearance than we had seen elsewhere in Ohio, owing, no doubt, to the fact that the soil is of a more sandy nature, and the plants had not suffered materially from drouth. Here, too, the Hovey variety is found to succeed pretty well, and its appearance in market is very fine. The growers for market in this vicinity have given very little attention to the newer varieties, Wilson's Albany and Hovey being almost the only kinds grown, and the former of these the most popular and abundant.

At the grounds of Mr. Case, and some others, we found a large number of varieties on trial as formerly (See Report for 1862), but not giving promise of much improvement. Several of the newly imported varieties, as Exhibition, Triumph, Wonderful, Honor de Belgique, and others with very large names, were found to yield a few berries of large size, but too few in number to be of any profit. Fillmore, Jenny Lind and Cutter's Seedling were thought to be valuable, and a foreign sort, called Jucunda (at Mr. Case's), was found particularly beautiful and excellent. Mr.

Bateham is quite confident that this is the same as is grown by Mr. Knox quite extensively, under the local name of "Seven Hundred," he having found it in a bed of foreign sorts in his grounds, without name, several years ago, and greatly admiring the appearance and quality of the fruit.

LETTER FROM WILLIAM PARRY, OF NEW JERSEY, ON STRAWBERRIES, RASPBERRIES AND BLACKBERRIES.

Cinnaminson, N. J., 7 mo. 11th, 1864.

RESPECTED FRIEND :—Thy favor of 22d ult. is received; also Report of O. Pom. Society, for which accept my thanks. I send the report of our West Jersey Fruit-Growers' Society.

With regard to *French's Strawberry*, we consider it entirely distinct from any other known variety, seeming to combine the good qualities of the *Large Early Scarlet and Hovey's Seedling*, and is probably a cross between them, as those were the principal kinds grown in the neighborhood where the original plant was found growing. Its quality is very good, large size, and early, and its appearance the most attractive of any strawberry in maket at its time of ripening. It brought 50 cents per quart readily, while Lady-fingers were selling at 40 and Albany at 25. It has generally been grown on poor land, without much attention; but Nathan Leeds has some on good land, properly cultivated. See an account of his berries in the *Gardeners' Monthly* for July, pages 204 and 207. It is a strong, vigorous grower, and multiplies rapidly, and will be extensively cultivated for market. It is not so large as Russell, but quite as large and productive as Fillmore. The latter variety I do not esteem so highly as Rev. J. Knox. Expect to plow under half an acre of old plants as soon as we have rain enough to soften the ground.

The small fruits are becoming of much importance here. We sold this season about 600 bushels of strawberries. Have been picking from 300 to 400 quarts daily of raspberries for about two weeks past. After trying nearly all the varieties that I have read or heard tell of within the last twenty-five years, I consider the most profitable *three* for culture to be "*Kirtland*," "*Doolittle Black*," *and* "*Philadelphia*." The first two are early, and done picking. We are now picking *Philadelphia* and the "*Miami Black;*" also, the "*Dorchester*" Blackberry, which will be in its height about the last of this week, and be substantially done by the time the Lawton is fairly under way. Ten acres of sandy land yielded me last season 700 bushels of blackberries; in 1862, 652 bushels. The vines are more heavily loaded now than ever before, and we expect a bountiful yield, should we be favored with rain sufficient to fill them out.

There is room for great improvement in the blackberry. We need one as early as the Dorchester, and large and productive as the Lawton or

New Rochelle. Newman's Thornless, Cutleaved, White Blackberry, and a number of others that I have purchased at high prices, are of no value for field culture. I have on trial the "*Holcomb*," and several other varieties, together with a number of seedlings of different kinds, the bloom of which were near each other, hoping to obtain something more valuable than we yet have. But I need help; one is not enough to experiment in so large a field.

The *dewberries* raised and distributed by Dr. Miner, of Honeoye Falls, N. Y., do not meet my expectations; cannot see that they are any better than our native dewberries, all of which I have had under cultivation for two years, and should have yielded finely this summer.

The Secretary presented the following letter on Strawberries and Strawberry Culture, from A. M. PURDY, of South Bend, Ia., July 6th, 1864.

M. B. BATEHAM, ESQ.:

Dear Sir,—I received yours of the 24th ult. In reply, would say, that for *profit, one year after another*, I find no berry superior to the *Jenny Lind*. First, it bears *early*, and if well cultivated, splendid fruit, of a beautiful scarlet color, uniform size, and of fine flavor. Second, it will bear large crops for a number of seasons in succession, on the same ground, without transplanting; in fact, it seems to yield better *after* the first bearing season. I have a bed five years old, which, notwithstanding the *severe* drouth we have had, yielded fifty bushels to the acre, and sold for about $8 per bushel in Chicago. (I have always grown them in rows, and do not know how they would succeed in hills.) Third, they throw out runners prolificly, consequently no trouble in having the rows fill up perfect and free with plants, which should be the main object in the row system. The reasons for this are, that if they fill up the rows full, they act like a clover or buckwheat crop in preventing the growth of weeds, by shading the ground, and likewise keep the fruit clean, thereby needing no mulching. In a plantation of strawberries, I should cultivate at least one-third Jenny Lind.

Another very important reason why I cultivate them is, that they are never affected by late spring frosts. A year ago, my Wilsons were *badly* cut by the late spring frost, while my Jenny Linds were scarcely touched.

As to the difference in earliness of the Jenny Lind and Wilson, you can pick a *few* scattering Wilsons as early as the Jenny Lind, but the latter will pick heavily at first, while the Wilson does not. Last season I sold a number of bushels of Jenny Lind before selling any Wilson. Usually there is from four to six days difference in their ripening for market. The Wilsons will yield the most fruit the *first* fruiting season and sometimes the second; but for years, on the *same* ground, the Jenny

Lind will outyield them. The reason for this is, that the Wilson so exhausts itself in fruiting that it does not form new roots, and consequently does not throw out runners perfectly; while the Jenny Lind starts a new growth *immediately* after they are through bearing.

I like the *Feast's Fillmore* very much. They are a fine yielder, very delicious, large and uniform in size, and bear carriage well. I sent a few to market this season, and they were looked upon very highly. My Chicago agent advises me to grow them extensively. He says, as soon as they become known, they will command a very high price. He sold those I sent for $10 per bushel at a time when Wilsons were selling at from $6 to $7. The Triumph de Gand is a poor yielder on my grounds, and I find such the universal sentiment of all the leading fruit-men west. The Russells fruited with me this season a little, and I am highly pleased with it, especially as to flavor.

I grow my plants in rows; set them one foot apart in the rows, and rows four feet apart; allow them to run along in the row, so as to form rows eighteen inches to two feet apart. Work among them with a fork-hoe through the season and once in the spring before they commence to yield. I do not mulch, as it makes them fruit later. They do not get sandy when the rows are well filled up with plants. As soon as they are through bearing we plow between the rows—plowing rows down about six inches wide; work well among them with the fork-hoe; scatter a liberal amount of manure among the plants after the weeds have been picked out; level down the rows with a drag. This very dry season has shown me that they cannot be worked among any too much in the spring before fruiting.

We prefer "row" to "hill" system, for the reason, that they are apt to be thrown out by frosts, if *in* hill, after fruiting one season; while if in rows, they make new plants and roots *every* fall, and such are scarcely ever disturbed.

ON PRODUCING NEW SEEDLING GRAPES.

Mr. G. W. Campbell, of Delaware, having been requested by the committee of the Society to furnish a report or essay on this subject, has presented the following:

GRAPES, AND THEIR PROBABLE IMPROVEMENT BY HYBRIDS AND SEEDLINGS.

Perhaps no subject occupies so large a share of the attention of horticulturists at the present time as the cultivation and improvement of the grape.

My object, however, in the present paper is not so much to call attention to the cultivation of the vine, as to the improvement of the grape itself, by the production of new varieties through the agency of hybridising, cross-breeding, and seedlings.

It is known to many that I have been for several years engaged in a series of experiments looking to this end, but I am compelled to say that up to the present time, although my experiments have been to me curious and interesting, I cannot claim that they have resulted in any thing of definite, practical value. It is true that very many of my hybrids and seedlings have not yet borne, and that sufficient time has not elapsed fully to develope the character of those that have; and though I regard some of them as promising well, I am not prepared, at present, to say more than this in their favor.

We all know that the new grapes which have been introduced within the past few years, with more or less pretension to superior excellence, have in most cases proven either inferior to, or no better than those already in cultivation. And although some catalogues contain a hundred or more named native varieties, less than a tenth of that number would doubtless include all that are in any way desirable. Indeed, with my present experience, the list of grapes which I would plant, in my locality, would be a very short one.

A grape, to possess the requisites necessary for general cultivation, should have: First—Hardiness sufficient to endure the severest winters, and sudden changes of temperature uninjured. Second—Earliness, enabling it to ripen as far north as the vine can be successfully cultivated. Third—A general adaptability to various soils, productiveness, healthy and vigorous growth, with strong and abundant foliage, capable of resisting mildew and the scorching heat of our summer sun. Fourth—Excellence of quality in the fruit—but, upon this point, tastes differ so much, I must be excused from stating just what the quality or flavor should be, though I would say, *decidedly*, it must have "*no bad taste*," and should be at once recognized by all as "*not bad to take.*" It should have a thin, tenacious skin, with little or no pulp, and be of equal consistence and character to the centre. Fifth—The bunch should be of large size, and handsome form; the berries also large and evenly distributed upon the stem, hanging firmly after full and perfect maturity. And if, in addition to all these qualifications, it should be capable of producing superior wine, I apprehend it would not be regarded as a *very* serious objection, unless by *very serious* individuals.

It is, perhaps, expecting too much to look for all the qualifications I have described in a single grape, though I do not despair of living to see it. The all-important question is: How can it be produced? It may be by a chance seedling; for, although the usual tendency of seedling grapes seems to be to return to the original, or wild type from which they sprang, there seems also an occasional, though rare, disposition towards improvement. To this occasional habit we are indebted for our most valuable varieties, such as the Catawba, Isabella, Diana, Concord, and probably the Delaware also. The new seedlings—Iona, Israella and Adirondac—are also instances of the same kind. But there are none of these, as far as known, that possess all the desirable qualities I have named. The Catawba and Diana lack both earliness and sufficient hardiness, except for specially favorable localities. The Isabella, though earlier, and in some places valuable, signally fails in others. The Concord lacks fine quality and high flavor, though it is hardy, healthy, and productive, and probably adapts itself to as great a variety of soils as any other variety. When in perfection, it is to most persons an agreeable, good fruit, though it does not retain its best flavor long after being cut from the vine, and the skin is so tender that it does not transport well to market. As to wine, I must say I have never seen any produced from it that I could commend—for if it is a *serious* matter to some persons to have even *good* wine made, I regard it as *much more serious* to have it *poor*, especially if I have to drink it!

The Delaware is very hardy, productive, early, and more generally approved for flavor and quality than any other American grape. It, however, lacks size, and in some places vigor of growth. It requires a rich, generous soil, and good culture, to produce its best results. With these, I believe it will be found to succeed over a larger extent of territory than any other good grape in cultivation in the United States. All things considered, I regard this variety as the most valuable acquisition yet introduced, for all purposes, and for general and nearly universal cultivation.

Of the new seedlings, Iona, Israella, and Adirondac, my experience is too limited to warrant very positive assertions. So far as my knowledge extends, I think the Iona a valuable acquisition. It is a vigorous and apparently healthy grower; the fruit which I have seen has been handsome and of fine quality, somewhat like the Catawba, but without hardness of pulp or astringency at the center. Whether it is hardier than the Catawba, I think doubtful; and its period of ripening is not earlier than the Concord. The Israella and Adirondac are in many respects alike, and are probably both Isabella seedlings. Both are claimed to be very early; both are grapes of good quality and agreeable flavor; but I do not consider their character in other respects sufficiently ascertained to say anything further in their behalf. There are many other seedling grapes that I might mention, but the limits of the present paper will hardly admit an extended discussion of all those that are really worthy of attention.

Next, as to hybrids and the probabilities of further improvement in this direction. The most noticeable of those already introduced are Allen's

White Hybrid, and the various numbers of Rogers' hybrids. The first named, Allen's Hybrid, has acquired a very good reputation in many localities, and is really one of the finest, if not *the* best white grape I have ever seen raised in the open air. The vine, as well as the fruit, retains a large portion of the foreign element; and many have doubted its being a hybrid at all, claiming that it is only a seedling from the Chasselas or Sweetwater. Mr. Allen, the originator, asserts that it was raised from an Isabella seed which had been impregnated with the Golden Chasselas. Judging from my own experiments in hybridizing, I see no reason to doubt Mr. Allen's statement, or that his grape is a true hybrid between the native and foreign varieties as claimed.

Mr. Rogers pursued a somewhat different course, taking for the pistillate or female parent, instead of a valuable variety, the Connecticut Mammoth, a native grape of the wildest type, and of quality unsurpassed—for *meanness!* The vine is one of rampant growth, and the grapes of great size, ripening early. There are usually but four or five berries on a bunch, of the strongest fox odor and flavor; they fall as soon as ripe, and wo to the man who picks them up and attempts to eat them, unless he has a tongue of sole-leather and the digestion of an ostrich! By fertilizing artificially, the blossoms of this vagabond of the wilderness with pollen from the Black Hamburgh and Golden Chasselas, and planting the seed therefrom, the grapes known as Rogers' Hybrids have been produced. These grapes, or such of them as I have seen, all indicate, in a greater or less degree, the powerful influence of the foreign cross, although none of them are nearly equal to the Hamburgh or Chasselas parents. They are all, however, most wonderful improvements upon the original Fox. Those of the Hamburgh cross have large oval berries, and usually large, compact, sometimes shouldered branches. The No. 4 seems to have lost almost entirely its foxy character, both in taste and smell; its bunches and berries are in size very nearly equal to the Hamburgh. In quality it compares favorably with Isabella, Concord, and grapes of that class. In vigor of growth and productiveness, apparently equal or superior to those varieties. Ripens a little later than the Concord. The No. 3 is a grape of the size and color of well grown Catawbas: ripens as early as the Delaware, and is, to my taste, the best of the lot, though Mr. Rogers himself gives preference to No. 15. Others, again, prefer No. 19. All this only illustrates the fact that tastes will differ about grapes as well as other things—produced from them. I have fruited the No. 3 for three years on a single vine, received direct from Mr. Rogers. It is in flavor and quality more like the Diana than any other grape I know, but much earlier, with larger berries and less pulp; when over-ripe, it has perhaps a little more of the native aroma than the Diana, and to some would be objectionable on that account. The No. 15 has not met my expectations, from the extravagant commendations I had seen in its favor. Most of those who have eaten it in my presence have been favorably impressed, and many regard it highly. To my taste it is not equal to No. 3. It is, however, due to the character of these grapes as tested by me, to say that I have never treated them in a manner calculated to give the best results, having grown the vines rather for the production of wood and layers than for fruit. I have also had many letters from parties who have fruited them, and I believe have received none but favorable reports; some even placing several of them above the Delaware. On the other hand, gentlemen of undoubted intelligence have questioned their character *as* hybrids, claiming that they are only seedlings from the common fox grape! This seems to me simply impossible, and I think would be so regarded by any one who had experimented much in the way of producing hybrids and seedlings; for, by planting natural seeds from the finest grapes of the best varieties, the chances of producing anything *better* than those planted are probably not one in a thousand. It would seem rather hopeless, with this view of the subject, to plant seeds from the very *worst* varieties with any expectation of valuable results. I can attribute Mr. Rogers' success to no other cause than the ameliorating influence of the pollen of the fine foreign grapes upon the worthless native. If it were otherwise, we must look to the *poorest* grapes for improved seedlings instead of the *best*, in which case I think I would recommend, next to the Connecticut Mammoth, or "Charter Oak," the *Oporto*. This would be upon the principle that as the progeny could hardly be *worse* than the parents, *any* change would be for the better. If any one chooses to pursue this line of experiment, he has my sympathies and best wishes for all possible success; but *I* do not care to spend any time in that way.

Long before I had ever heard of Mr. Allen's or Rogers' experiments in hybridizing, my attention had been directed to this subject, from observing the mixture apparent in many flowers and vegetables in the next generation, where the parent plants of different colors or varieties had grown in immediate proximity. I attributed also the diversity of fruits produced by planting the seeds of the apple, pear, peach, and other cultivated fruits, to the same influence, the pollen being carried from tree to tree by bees and other insects. I theorized, also, that if a tree or vine were so perfectly isolated from others of its kind that only self-impregnation were possible, its seeds would reproduce the parent with little or no apparent variation. It also seemed probable, that if hybrids or crosses between our best native and foreign grapes could be produced by artificial impregnation, a class of grapes *might* be originated, superior to any of our native varieties, for all purposes. As in the animal kingdom the most valuable results had arisen from judicious crossing, why not in the vegetable also? If we could, by this means, introduce into the best of our native grapes the more delicate, high-flavored and refined character of the foreign varieties, it would seem that the result must be advantageous; while the infusion of the native vigor and stamina of our harder natives might also be expected to be equally beneficial to the foreign sorts. These and similar considerations induced me to commence hybridizing, and raising seedlings, and I intend to continue the pursuit as long as I am permitted to live; believing that my experiments, even though unsuccessful in producing immediately useful results, may have a value to those who may hereafter be inclined to pursue this subject, by enabling them to avoid my errors, and profit by even partial successes. My first experiments were directed towards producing, if possible, a cross, or reproduction of the Delaware, retaining its quality, with increased size and more vigor or strength of vine. To this end, I selected seed from the finest and largest Delawares. I also made a cross, by impregnating the Logan with pollen from the Delaware; also, fertilized the Delaware from a large black foreign grape, believed to be the Black Portugal. The Logan was chosen as the staminate or female parent in several crosses, on account of its earliness, perfect hardiness, and healthy, vigorous growth. Its berries, also, being larger than the Delaware, I hoped for seedlings with fruit of increased size upon vines perfectly hardy, vigorous, and healthy. As results of this cross, some of the vines have borne fruit of no value, being inferior to either parent. One or two others are decided improvements upon the Logan, but not equal to the Delaware. All that have fruited from this cross are black in color, and early in ripening; some have compact and handsome bunches, and the best of them are about intermediate in quality between the Logan and Delaware; seeming, both in quality of fruit, foliage, and every general characteristic, a perfect mixture of the two varieties. But two of the natural Delaware seedlings have borne—both white. Of one of these I had high hopes, believing it would probably be one of our best white grapes, when fully developed. Unfortunately, thus far, it has not developed *in the right direction!* Instead of improving, as I expected and hoped, it was, this season, later in ripening, smaller in bunch and berry, and inferior in quality to its first season, three years ago! The other has borne but once, and may or may not prove valuable; probably *not!* You will understand, when I say *valuable*, I mean having some desirable quality above varieties already introduced; for I can see no advantage in multiplying kinds that are simple reproductions of existing varieties, or no better than those we have at present.

The following season I crossed the White Frontignan and Black Hamburg also upon the Logan. The Frontignan seedlings seemed to partake too much of the nature of the foreign vine, being deficient in hardiness, and disposed to mildew. None of them have yet acquired sufficient size and strength to give fruit. The Hamburg seedlings seemed much stronger, healthier and hardier. Two of them fruited the past season. One had the finest clusters I have ever seen upon any seedling, in its first bearing—large, handsome, and compact. It commenced coloring before the Concord, but ripened slowly, and was not fully matured before the first of October. It was nearly free from pulp, sprightly, agreeable but rather acid, and not good enough to disseminate unless it improves on further trial. The other had but one small bunch—ripened earlier, and seemed of better quality than the first named; is worthy of further trial. In foliage, these two varieties closely resemble the form of the Black Hamburg leaf: deeply lobed, and indented, but in texture the leaf is like our hardiest natives, very thick, and capable of resisting mildew and scorching sun. I also crossed the Catawba upon the Logan, hoping to obtain the quality of the Catawba with the earliness and hardiness of the Logan. Most of these seedlings seem very vigorous, hardy, and healthy every way. The fruit of some of them I regard as promising, but not sufficiently developed to warrant any positive declarations.

The cross which I mentioned, between the Delaware and Black Portugal, produced some seedlings of great vigor of growth and beautiful foliage, from which I had "great expectations." Such, however, as have fruited, have produced only small, black grapes, late in ripening, inferior in size, and of no probable value, though I shall keep them for a while longer, upon probation.

Some crosses between the Delaware and Black Hamburg, and Delaware and Grizzly Frontignan, are strong, healthy vines, and will probably bear next season. A seedling from the Lydia bears a white grape, much like its parents, but in no respect better. Some seedlings from Allen's White Hybrid resembled closely their parents in foliage, but lacked vigor, mildewed badly, and finally died. I may here remark that a pretty large proportion of all grape seedlings are weakly or imperfect. Many mildew badly; others show no vigor of growth, and either die outright the first season, or after a year or two of feeble effort, give up, even under careful nursing. Only those that show vigorous and healthy habits are retained. A few seedlings from some of Rogers' Hybrids seemed hardy and vigorous, with varied foliage; some resembling the foreign leaf in texture, others the native. From some of these I expect fruit next season. I also re-crossed or hybridized several of Rogers' Hybrids with Delaware, Black Hamburg, Frontignan, &c., but shall get no fruit from them for several years. I also hybridized Taylor's Bullitt with White Frontignan and Golden Chasselas, hoping to produce a white grape of the character of the foreign, with the vigor and hardiness of the native. More recently, I have crossed the Concord with the Delaware, and also with the Chasselas Musque; and, the present season, the Union Village with the Delaware. I expect fruit from a large number of seedlings and hybrids next season, and am fully prepared for either disappointment or success. I may mention, also, that I have replanted seed from the best of the hybrids and crosses that I have produced, but none of them have yet borne.

It may be interesting to some present to know how this hybridizing or crossing of varieties is performed. To be certain of success, the grape blossom must be opened artificially, before its natural period of flowering, and all the anthers or stamens removed before the pollen or fecundating dust is formed, leaving only the bare germ, with the stigma unfertilized. To prevent the possibility of impregnation by bees, or insects, or the wind conveying pollen from other sources, the prepared blossom-bunch is inclosed in a tight, oil-silk case, and pollen supplied at the proper time from whatever variety it is proposed to cross, or hybridize with. When the berries swell, and commence growing, it is an indication that the process has been successful; and the oil-silk covering may then be removed, the bunch carefully labeled, and the seed from these berries, when planted, are expected to produce crosses or hybrids having characteristics of both parents.

I have also tested the accuracy of my experiments in various ways. In one instance I prepared a bunch, as if for crossing, by removing all the stamens, and inclosed it in the usual manner, but applied no pollen. Upon removing the covering some days after, every berry but one had blasted, and fell off at a touch. This one berry, being from some cause later than the rest, was just in condition to receive pollen, which I supplied from the Chasselas Musqué, and produced a grape, from which I have a seedling that may prove valuable. Other bunches, prepared at the same time, upon the same vine, and supplied with pollen at the proper time, were all fertilized, and produced full and perfect bunches. The Logan and Taylor's Bullitt both set their fruit unevenly and imperfectly, and produce usually small, straggling, and unhandsome bunches. When fertilized in the manner above stated, they have produced handsome and compact bunches, the only ones of that character upon the vines.

Seedlings almost uniformly indicate their parentage by their foliage. That of hybrids with the foreign vines is usually deeply lobed; often having much more the form of the foreign than the native leaf, although grown from the seed of the native parent. Some have foliage intermediate or resembling both in some degree. Also, in the crosses between natives, some resemble one parent and some the other. Others again seem a mixture of both. In one instance, however, in the crosses between the Logan and Catawba, a perfect type of the wild vine of the forest was produced—probably a barren one, for it has never shown blossom or fruit, though of sufficient age and rampant growth.

These descriptions might be extended much further, but it is believed enough has been said to give a general idea of the subject, and of the nature and tendency of my efforts. And I cannot help expressing regret that I have not more important facts and more decided success to record. I feel, however, that my experiments and their results are yet undeveloped. A few more years will probably determine either their benefit or their usefulness. If it shall prove a means of improving our native grapes with a reasonable degree of certainty, I shall feel that I have labored to some useful purpose; if, on the other hand, it shall only determine that we cannot reasonably hope for valuable improvement by hybridizing and crossing varieties, it may deter others from wasting time, and incurring disappointment in a hopeless though alluring pursuit.

GEO. W. CARPENTER.

Delaware, O., December, 1864.

JACKSON'S CUTTING MACHINE.

The committee appointed to examine Mr. Jackson's "Cutting Machine for Nurserymen," have had the matter under consideration. They regret that the machine is not accompanied by an expert in its use, or that they cannot test its usefulness by applying it to the purposes for which it was intended, in the work shop, and on material as it ordinarily goes into the hands of the workman. The following is the result of our observations:

1st. As to the perfectness with which it performs its work: We find that, on grape wood, it is difficult to make a cut with it, without roughing the surface of the cut, but that it does not amount to a cracking of the wood to any depth. Whether it is *essential* to have a perfectly smooth surface on the base of the grape cutting, we are not prepared to say, though it is a common opinion among propagators that such a surface greatly increases the chance of success. We are told by an extensive cultivator who makes the propagation of the grape a specialty, that in preparing wood of which he is scarce, he smooths the surface of the cut with a knife after he has prepared it with the shears. In all other respects it will perform the work. On other wood of which cuttings are made, it is our opinion that it will do good work, and without bruising the bark, as the under part of the ordinary pruning shears commonly does.

2d. As to its *labor-saving* qualities: It is claimed that with it one man can do the work of at least four, with the ordinary tools. We are not prepared to endorse this without seeing it used by an expert, and on miscellaneous collections of wood, just as it is taken from the vines. With the insufficient trial we have been able to give it, on grape wood, we found that by the time the dry tendrils were removed, we consumed about as much time in making a given number of cuttings as we would by the ordinary method. This may have been, however, because of the awkwardness naturally incident to handling a new machine.

J. J. Harrison,
J. R. Swan,
S. B. Marshall,
Committee.

SHIPMENT OF APPLES AND POTATOES FROM LAKE COUNTY, FALL OF 1844.

The following are statistics of the shipments of apples and potatoes from the several railroad stations in Lake county for about three months, ending last of December, 1864. This does not indicate the extent of these crops, as not over one-half the aggregate for the season had been shipped up to that time. The large item of cider, also, is not given at all.—*Sec'y.*

Railroad Stations.	*Green Apples.*	*Dried Apples.*	*Potatoes.*
Willoughby	3,068 bbls.	23,825 lbs.	7,710 bush.
Mentor	6,485 "	4,480 "	10,530 "
Painesville	6,024 "	418,483 "	13,212 "
Perry	6,511 "	4,029 "	25,377 "
Madison	5,040 "	......	16,400 "
Unionville	2,574 "	......	10,100 "
Total	29,702 "	4,050,817 "	83,329 "

ROBERTS' FRUIT HOUSE.

This was described at the annual meeting by Mr. Boalt, of Norwalk, Ohio, who is part owner of a house erected on this plan the past year in that village. It is the invention of a Mr. Roberts, of Michigan, who is said to have obtained or applied for a patent for it.

It consists simply of a chamber or room, of any size desired, in the centre of a large ice-house. The one at Norwalk has two chambers, each about eighteen by thirty feet, and the entire building outside is about fifty by eighty feet. The outside is of wood, filled in with saw-dust, then eight feet of ice on all sides of the chamber and overhead.

Care must be taken to secure drainage below the ice, and a condensing tube is placed in each chamber to condense the moisture [the form and position of this was not given]; also a pipe to carry off the water beneath the floor. The opening or entrance to the chambers is from above. The floor is made of oak plank laid on two feet of seasoned brush. The cost of the structure was about $2,500. Its utility has not, perhaps, as yet, been thoroughly tested.

COLE'S APPLE BIN.

This is a much simpler and less perfect plan for keeping apples, for which a patent has been applied or obtained by Messrs. S. S. & G. W. Cole, of Illinois. One of the gentlemen was present at the meeting in Painesville, and explained the mode of construction and use of the invention substantially as follows:

"In a barn, wood-shed, or some airy building (north side preferable), upon a good floor, construct a bin with double walls, leaving a space of eight or ten inches between them; cover the floor to the depth of eight or ten inches with saw-dust, or some good non-conductor; upon this lay some boards, and upon them some three or four inch scantling, to support a floor, which should be made of slats or narrow boards, leaving the spaces between them about one inch wide. This leaves a space of three or four inches below the slatted floor called the air-chamber, which should be well ventilated, by cutting holes through the double walls, and fitting in air-tubes three or four inches square, made by nailing boards together of sufficient length to pass through the double walls. Nail wire screen over the inner end of the tubes, to prevent rats and mice getting in. The space between the walls should now be filled with saw-dust, being careful to pack it well around the tubes.

"The apples may now be placed in the bin as they are gathered from the orchard. Leave the bin uncovered and the air-tubes open until there is danger of the apples freezing, then cover them with boards, letting the boards rest on joists and the inner wall, which should be eight or ten inches lower than the outer wall. About the center of the cover make a hole eighteen or twenty inches square, around which nail boards of sufficient heighth to prevent the saw-dust from falling in. Make a box twelve or fifteen inches high, that will fit this opening, on the lower side of which nail wire screen, the upper side being left open. This is called the ventilator, and may be removed for the purpose of taking out apples.

"When the apples begin to freeze put saw-dust on the cover to the depth of eight or ten inches. During the warmest and coldest weather close the air-tubes well and the ventilator loosely with straw, and open them occasionally, when moderately cold, so as to keep the apples as cold as possible without freezing much till the latter part of winter, at which time open the air-tubes and ventilator during cold weather till the apples most exposed are well frozen; then fill the air-tubes with saw-dust and tack on a piece of board to keep it in; fit a board into the ventilator, and in the center of the board put a ventilating pipe long enough to reach from the wire screen to the top of the ventilator, having a hole an inch and a half or two inches in diameter, which should always be left open. The ventilator may now be filled with saw-dust. In this way they should remain undisturbed during the continuance of frost among them, after which the ventilator may be removed, in the coolest part of the day, for the purpose of taking out apples, and then replaced. The warm weather of early summer will gradually extract the frost from the apples—the vapor passing out at the pipe—and they will be found to have retained their original flavor. In this way as many as five hundred bushels may be kept in one bin.

"We give this plan as the most suitable for a permanent bin. It also illustrates the principle of ventilating, which may be applied in others with less expense and succeed very well; for instance in a cellar where a good circulation of air can be admitted, a single walled bin will do by filling in a good coat of straw around the apples as they are filled in, and using the mode of ventilating above described. The same mode of ventilating and freezing can also be successfully used in a cave or by the usual method of burying in the ground. In all cases the apples should be completely protected from heat or cold, after winter sets in, except by means of the air tubes and ventilator."

HOUSES FOR PRESERVING FRUIT.

In the tenth report of this Society (1862), p. 29, is a brief description of a plan for the construction of houses for the preservation of fruits, the invention of Mr. Nyce, then a resident of Indiana. Since that time Mr. N., in connection with other gentlemen, has erected a large house of the kind in Indianapolis, and also one in Cleveland, and, it is said, will shortly erect still larger ones in Cincinnati and New York, the plan having been found perfectly successful where tried, and hence likely to be speedily adopted in all the large cities.

An idea of the plan and construction of these houses may be obtained from the following description of the one in Cleveland, which has been visited by most of the members of the committee ad interim of this Society.

The fruit house is located on Kinsman street, about a mile from the park or public square. It was erected a little over one year ago, by Messrs. Nyce, Shirk & Co., and recently (1865) purchased by Messrs. Beckwith & Brockway.

The building is constructed of wood and iron, is about 80 feet in length and 40 feet in width, two stories high, divided into several compartments. The upper story contains ice, put in every winter, in depth five to six feet.

This is separated from the fruit room below by a floor of galvanized iron, the sheets of which are closely riveted and soldered, so as to be perfectly water tight. The walls are made of two casings of sheet iron, 3½ feet apart. The edges of these sheets are painted and closely nailed to upright studding, the intervening space being filled with chaff, sawdust, or short shavings, or other non-conducting substances. The floor of the fruit room is also made of galvanized iron. Below this are placed shavings, three feet thick, on a coating of tar and pitch, spread one inch thick upon the ground, to prevent the entrance of moisture. One or more wind-wheels are placed above the roof, geared to fans in the fruit rooms. On the floor of the fruit room was spread formerly, in its dry state, the *chloride of calcium*, a substance which has great power of absorbing moisture; but now the waste "bittern," from salt works (absolutely costless, excepting freight,) after being dried, is found to be equally as efficient as the former chloride.

The elements of a complete preserving atmosphere are, coldness, dryness, purity, quality of temperature, at all times, and in every part, absence of light, and, if possible, the exclusion of the great agent of decomposition, the oxygen of the air. This plan secures all these elements in great perfection. The thermometer shows a uniform temperature of 34° in all parts of the room, and is found not to vary a single degree from 34° even from April till October.

Dryness is its leading patentable feature. Vapor is constantly given off from different kinds of fruit, amounting usually to at least half a gallon of water from one hundred bushels per week. This vapor is taken up by the absorbent, which is spread over the floor of the fruit room. It is made to run out in tubes to the outside, once in about every month. It is then dried in large pans, of sheet iron, and returned to the house in the dried state as before. The same substance is thus used twenty or thirty times. The air in a room so completely confined, after the fruit is chilled down to 34°, becomes very still. The fans are needed to give circulation to the air, and bring the moisture arising from the fruit in contact with the absorbent, to be taken up by it.

The air is pure, because every source of impurity is excluded.

In the gradual ripening of fruit, hydrogen and carbon are constantly given off; the former unites with the oxygen of the air, and forms water; the latter, carbonic acid.

This process in any confined vessel filled with fruit consumes all the oxygen, especially if the fruit be ripe, and the air warm, in about 48 hours. The rooms of this house are gas tight, and when filled with fruit, if closed up for two days, a candle goes out in them almost instantly.

The fruit is then surrounded by an atmosphere composed of the nitrogen of the air and carbonic acid. The former is destitute of all active properties, good or bad. The latter is not sufficiently acid, unless under heavy pressure, to produce any action on fruits immersed in it. Hydrogen and carbon then cease to be evolved from the fruit, as there is now no agent to unite with them, in the same way that they cease to be evolved from a burning candle when the air is removed. Decomposition ceases in both cases, and for the same reason. The principle is thus stated by Liebig: "Decay is much retarded in the absence of moisture, and by the substance being surrounded with an atmosphere of carbonic acid, which prevents the air from coming in contact with decaying matter."

The sources of profit are pears and grapes, kept during the fall and winter months; apples until the months of May, June and July; lemons, oranges, pine-apples, through the summer season; canned fruit, put up in six or ten gallon cans, and retailed out by measure; the fruit when taken from the cans, which are used successively for a number of years, is kept fresh in the house in the open vessel for a number of weeks. Hence this fruit may be sold by measure without loss in the summer months. Oysters, butter and eggs are also sources of profit.

All fruit should be in the house when tree-ripe; that is, as soon as it has received all the virtue the tree or the vine can impart to it. Liebig says: "Rub an unripe or green apple or pear on a grater to a pulp; wash this with cold water on a fine sieve,—the turbid liquid which passes through deposits a fine flour of starch, of which not even a trace can be detected in the ripe fruit. This after-ripening, as it is called, is purely a chemical process. It is the starch being transformed into sugar; the more starch the unripe fruit contains, the sweeter does it become when ripe."

Although, after the saccharine change, purification may go on slowly at 34°, yet starch is much more slowly changed into sugar at that temperature. In strict accordance with this principle, it is found that the most tender fruits, if put in immediately when made, keep better than the more hardy sorts, if not put in till full ripe. One bushel of apples, if fully ripe, throws off more hydrogen, and forms more water, than three bushels, if put in in the proper season.

It is believed and claimed by the patentee and by all the scientific gentlemen who have examined the subject, that there are but two known modes, for practical use, of drying air; and, as we have already stated, dryness is the leading patentable feature of this house, and the *sine qua non* of preserving fruit in full health and flavor. One mode consists in throwing the air upon ice, or an ice-cold surface; the other, in forcing it upon absorbents. The principal experiments hitherto have concerned the former method, which is a very imperfect and unsatisfactory one. For by it the air gives up only so much vapor as is in excess of its capacity at 32°.

still as wet as it can be at this ice-cold temperature. The absorbents used in Nyce's fruit rooms condense vapor freely from the driest air, even when chilled down to zero, or below it. His fruit house, without absorbents, presents one of the best arrangements to dry air by the first method, as it presents the largest ice-cold surface on its upper part, the place to which the vapor from the fruit, always somewhat heated by the chemical change that produces it, immediately ascends. But experience has clearly shown in this house that present results could not be reached by this method alone, and it would seem, and it is positively claimed, that the plan adopted in the Kinsman street fruit house is the only one which will at once insure a dryness sufficiently uniform and perfect and a constantly equable and adequate degree of coldness.

But people are impatient of theories, and crave results. They wish to know, first of all, how the fruit has kept, and if the experiment is a success, and if the institution "pays."

To these inquiries very hopeful and satisfactory answers can be given. Not more than three or four apples in a hundred, on an average, have decayed thus far in these rooms (15th May.) And there is this peculiarity in the decay of the fruit: When a decayed apple is found, it is universally found totally decayed, and surrounded by fruit not at all tainted by its rot, proving that the defect was already in the apple at the time it was put into the house. The patentee is positive that if an apple has a sound skin at the time it is housed, he can preserve it in full health and flavor, by means of the agents, dryness and coldness, although it very rarely occurs that fruit, apparently sound, has an internal power of decay, over which science has as yet attained no control. But if an apple can be plucked from the tree at the time it has sucked all the virtue which it can draw therefrom, and has a sound skin, Prof. Nyce will put the same in his rooms, and successfully defy it to decay. And this is the great problem now to be solved, to wit: The determination of the precise time when fruit should be removed from the orchard to the preserving rooms. Long years of observation and study, of the habits of the various fruits, must go to the perfection of that man's insight and intuition, so to speak, who shall become master of this difficult science.

The following certificate, dated March 20th, 1855, was signed by a large number of prominent citizens of Cleveland, and published:

"The undersigned, citizens of Cleveland, Ohio, testify that the fruit house erected here by Nyce, Shirk & Co. has supplied, at reasonable rates during the last winter, Catawba grapes in sufficient quantity to meet the demands of our citizens. That these grapes are to this day as fresh, plump, and perfect in flavor as when taken from the vine. The bloom is yet on them, and many of the stems are as green as they ever were. We cannot doubt but that they will yet be kept in complete condition for months to come. Our more tender varieties of fall apples, some of which have been out of the market for months, are firm, crisp and juicy. They have now on hand about 5,000 bushels, embracing the leading varieties of our climate, which some of us have seen to be in the best condition, and from which we expect to be supplied during May, June and July next. We look upon this improvement as a great benefit, as well as an honor to our city. It is, beyond question, a success; and must soon, we think, rank among the prominent improvements of this age, and to the country at large."

PRESIDENT'S ADDRESS.

Fellow-members of the Ohio Pomological Society:

Having been permitted once more to reassemble for our annual love-feast around the plenteous festive board of our favorite Pomona, it is becoming that, while we are occupied in the exchange of congratulations with one another, we should also open our thankful hearts in acknowledgment of the manifold blessings by which we are continually surrounded by Him who governs the seasons, and who sends the sunshine and the shower.

In His wise providence, he has furnished these vast plateaus of fertile soil, diversified with hill and vale, whereon He has placed us to carry out his designs by our labor in subduing the forest, that we may render the earth capable of sustaining its millions of happy and intelligent beings who shall render unceasing praises to His name.

He who so wisely governs the universe of His creation condescends to regulate the smallest affairs of life, and the commonest operations of the farm and the garden are subject to His laws and are dependent upon His smiles for their success. How important then that, while we humbly acknowledge His power and wisdom, we should meekly inquire into those laws by which He governs such parts of the vast machinery as are placed under our control, in order that we may best discharge our duty to Him and to society.

* * * * Among our manifold blessings let us acknowledge that we have been permitted, again and again, thus to meet in the midst of a war of the most stupendous proportions—a war involving not only the continuance of our admirable government, threatening its very existence, and the complete overthrow of our favorite institutions, but promising in its results, which must be eventually on the side of right, to establish more firmly than ever the great ideas of American liberty, freedom to all, and the widest enlargement of an enlightened policy. * * * In the midst of such a war we are now again allowed to assemble ourselves for the prosecution of our labors in one of the arts of peace, and to sharpen our pruning-hooks, instead of whetting the sword or burnishing the bayonet.

How many of our sons and brothers, alas, have already laid down their lives in the cause of their country, in the cause of freedom! Perhaps many more must die, but the end approaches; right will surely give might, in this terrible struggle, and the result will re establish our glorious principles of American liberty. The *world's day star*, pointing the nations to a noble future for all the down-trodden races of men, will again soon be in the ascendant—the banner of freedom will be bravely borne aloft by the strong arms of American freemen!

NECROLOGY.

As is usual, in the annual curriculum of human events, we are again called to mourn the loss of friends, who formerly worked with us shoulder to shoulder urging forward the good cause in which we are engaged. * * Since our last meeting some have been taken who were bright ornaments to society as well as valuable workers in the great industrial hive. The aged and the young have alike fallen. Some have suffered by the hand of traitors in arms against our noble Government; stalwart young men have fallen, sacrifices to their country, immolated upon the altar of patriotism—noble offerings on account of whom, though we be saddened, we feel proud; others were of matured years, full ripe, and crowned with honors, from their well filled course of duties fully discharged; they have dropped like well ripened fruits upon the lap of earth, and returned to the dust from which their bodies were formed, but their examples are left, and their bright spirits will, we trust, long continue to look down with approving smiles upon all our efforts for the highest improvement of ourselves, and of the world for whom we labor.

In the first category we must mourn the loss of Jno. Jackson, Robert Reilly, J. Saunders, noble though youthful patriots!

In the latter, we feel and regret the absence of the excellent A. G. Hanford, Stephen Mosher, Robt. Bowler, men of high position, social and pomological.

Upon their honored graves our tears we shed—
With us they wrought in works of love,
But now, alas! both young and old are dead!—
Our griefs their blessed mem'ries move.

OUR WORK.

Turning from this pious duty toward the memory of the departed, we should endeavor faithfully to discharge the labors they would have aided us to perform. We who are left must close up the thinned ranks and apply ourselves with greater energy to the work before us. That work is, in a great degree, the observation of objects in nature; the task is simple, the labor is easy, but it requires a degree of persistence in us which some may find irksome.

We must observe the skies; the ever varying seasons should be watched, and their effects for good or for ill to our crops should be noted. We must study the peculiarities of our different soils and their influence upon our various fruits. We must investigate the laws of plant-life, so as to understand and properly to appreciate the operations we have to perform in propagation and culture, in fruiting our orchards, and in maturing their rich harvests. We must learn to distinguish these fruits one from another, and should familiarize ourselves with all their nice shades of difference. We must also study our insect enemies, and endeavor to discover means for the prevention of their ravages upon our crops. When we come to speak of fruits, it will be important that we adopt correct terms, to be systematically employed in giving them accurate descriptions, and we shall have to familiarize ourselves with the various synonyms by which they are known. Thus we shall find abundant exercise of our faculties.

METEOROLOGY.

In taking a view of the peculiar meteorological characters of the past season, we are impressed with the beneficence of the Creator, in giving us such a noble territory of productive soil, varied as it is by circumstances that modify the climate in a wonderful degree; we are, however, at the same time, mortified by finding how little we know of the laws of meteorology by which the climatic conditions of our globe are governed. On this account, however, though we be mortified, we must not be discouraged; let the present imperfect state of our knowledge of the laws governing the temperature and moisture of our atmosphere, be incentives to continued systematic observations, and we may confidently hope that at some future period, the problem which is at present so puzzling as to baffle our calculations, may at least be understood, and if properly appreciated, we may also hope that, to some extent, the elements may be brought under our control. For these desirable results we already have some encouragement to hope. Certain constant atmospheric phenomena have been observed in different localities, and if we cannot expect ever entirely to *rule the storm*, we may at least anticipate that certain effects in portions of the country will continue to accompany particular attendant circumstances of the geognostic arrangement of land and water, hill and valley, marshes and desert plains, forests and prairies. You will all recollect the valuable contributions referring to the peninsular and lacustrine influences that were presented to the Society at its last meeting, and you are referred to them for study and encouragement. To the residents of this portion of our State the lake influence will be of deep interest.

The terrible storms of cold that sometimes visit us should be closely studied in all their relations, their extent, their direction and progress, their limits in different directions, and, in fact, in every respect in which they can be appreciated. In this way we may hope to discover the ruling principle that controls them, and we shall no longer blindly and ignorantly consider them merely in the light of Divine inflictions of wrath visited upon our wickedness, much less as mere accidents of chance, that occur without rule or reason, but we shall no doubt learn that every such occurrence is but a part of the grand connected and dependant whole, most wisely and wonderfully arranged for the best purposes, by Him, who, while he rules the storm, regulates all the elements of His universe in the best possible manner.

Alas! that we have made so little progress in any of the great departments of knowledge. But we should not be discouraged, any more than the child, to whom the wonders of his little life are unfolding themselves by slow degrees. Like him we must receive one impression, learn one fact at a time, and store them away in our records of observations. Let this be done for a period of years, no matter how long continued, and over an extent of territory no matter how wide, and, we may depend upon it, these accumulated observations, if properly made and recorded, under the direction of those who have learned how, and taught us how to observe, and the phenomena of climate will eventually be wrought out by a master mind—some genius in meteorology—in a way that will be satisfactory.

To those engaged, like ourselves, in the pleasant occupation of nurturing the delicious and health-giving fruits, with which modern pomology has blessed mankind, this study of meteorology assumes the greatest importance, since the influence of climate is a most disturbing element in the great problem of fruit-growing, the practical solution of which we have attempted.

A single fact connected with the terrific storm of cold that opened the present year may here be mentioned, which, connected with the known progress of all great storms in an easterly direction, becomes of practical interest and importance. I refer to the limit of the storm in this region, or to its modified severity, as it approached this meridian. It appears that the storm of January 1st, 1864, commenced as far as the line of 30 degrees west from Washington. It extended north and south for several degrees of latitude, it progressed to the eastward with rapid strides, as learned by the telegraph, and that it was very severe on its southern margin or extremity, we were also informed, producing an unheard of degree of cold in some of the cotton States. But it also appears that the severity of the cold diminished after a while; as the storm progressed eastwardly its fury diminished. Beyond a certain point, the cold was not remarkable. We are now near the eastern limits of its severity, and the evidence is before us, in the healthful orchards, the living plants, and these beautiful fruits, that you have not suffered so severly as some of us, whom you had supposed were enjoying summer skies and a more genial climate. We, who have suffered so severely in the loss of our trees and our vines, are rejoicing in your more fortunate circumstances, and come to fill our baskets from your plenty. This, the great extent of our country, and the varying climatic conditions of different sections, enable us to do.

In some respects the southern portion of the State will ever have the advantage; in others, you of the north will claim pre-eminence. From us you must obtain the earliest products of the season—the first vegetables and fruits ripen in the more sunny south, which is most generously disposed to divide them with the citizens of the more tardy northern region, as the tons of freight on every train running in that direction in May and June abundantly testify. In October and November, however, the same great arteries of trade are equally burdened by the transportation of your noble fruits; your glorious apples, your beautiful smooth pears, and even your luscious grapes, find grateful consumers among the citizens of the southern borders of our broad State. The statistics of trade show that during the months of September, October and November, we have received at Cincinnati 120,604 barrels of apples from the north. It is also well known, that the berries and vegetables are shipped from Cincinnati during May and June at the rate of five tons per diem, by express trains alone.

THE AMERICAN POMOLOGICAL SOCIETY.

It may be well for us, from time to time, to consider the work we have to do. And this very naturally leads us to observe what other kindred associations are about. Though we have claimed to be the oldest pomological society on the continent, we may very safely acknowledge ourselves in some sense tributary to the American Pomological Society, since that organization covers the whole extent of North America, wherever fruits may be grown, and we represent only the State of Ohio. We do freely acknowledge such superiority, and we know the noble men who have long been actively engaged in the great work. We have worked with them, shoulder to shoulder, and we shall continue to do so. This allusion to the national association leads me to refer you to its excellent and now venerable leader, who has for so many years most ably conducted the valuable deliberations of that society. At the recent session, held at Rochester, N. Y., he was unable to be with us, in consequence of impaired health. His absence was felt by every member of the society—the ruling spirit, who had taken so deep an interest with us since its earliest organization; he, to whom its active vitality was in so great a measure due, could not be there to participate with us; but we could not spare his future interest in our doings, and he was unanimously re-elected to the high position for which he is so admirably fitted.

Our western friends will also feel it a matter of congratulation that this great society has determined to hold its next biennial convention in the valley of the Mississippi. Though few delegates were in attendance from the western societies, our eastern friends yielded to our earnest solicitations to have the benefit of a meeting among us, that will bring together the best pomologists of the nation. That meeting will be held at St. Louis, Mo., some time in the autumn of 1866. To it all of us will look with joy and pride; for we shall then not only have an opportunity of exhibiting our noble fruits, but we shall have them scanned by our seniors in pomology; and while we indulge the hope that they will be with us in great numbers, let us determine to give them a rousing welcome—let us determine to present a numerous attendance, and to have the products of our orchards and vineyards most fully presented upon the tables.

OUR SOCIETY.

In the meantime, we have our own work to do as a society. We must continue to labor in the course of progress we have assigned to ourselves as a State Society. There is work for every one of the members. Each should dilligently observe, and note the results of his observations. There is nothing like this habit of close observation to develop facts and to enable us to diffuse knowledge among men. How simple soever the matter may appear, it may prove to be of the greatest value; and though a thousand observers have noted the same fact a thousand times, it may be so presented to the last individual as to become of immense value to the cause of science. Of this we have numerous examples in the history of human progress. Fail not, therefore, every one of you, to condescend to minutiæ—condescend to things of low degree.

The benefits of the labors of our *ad interim committee* have, it is believed, been fully demonstrated to the Society in the many years that body of observers has been at work for us, during the intervals between our annual meetings. Animated by the proper spirit, they may yet continue to do much good for us by collecting and collating facts gathered in their tours of observation, which, it is confidently hoped, will be continued, and toward which the legislature has made a small appropriation. This is only proper, since the results of our labors are diffused for the benefit of the whole State, for we are actuated by no selfish aims. Our fellow members should not depend upon this committee. Every individual of the Society should contribute his mite, be it nothing more than in setting an example to his neighbors, encouraging them in the good work of fruit-growing, and thus diffusing everywhere a greater love for the culture of orchards, vineyards and gardens, as the means of health and happiness to our people, as well as sources of wealth to their owners, and through them to the State.

You can do much good by conversing with your neighbors about the pleasures and profits of fruit growing; you can relate your experience and that of your friends; and, as an inducement to others to emulate your success, if you cannot persuade people to purchase good fruit trees, by all means give them a few choice specimens. If the old repel your advances, try to influence the young, who have more faith and hope. I know of nothing so accessible as the heart of youth, when approached by the offer of something to plant. Indeed, children's gardens afford a very important element for that portion of their education which conduces to habits of carefulness and industry, besides the pleasure furnished to the juvenile horticulturist by tending his plants and watching, from the sowing of the seed, their germination, growth, blossoming, and production of fruit. What lessons of faith are thus instilled into the infant mind, and how naturally will the thoughts be led by the love of the beautiful productions of the Creator, to a contemplation of His glories, who has so wonderfully and excellently made all things!

OTHER OBJECTS OF STUDY.

In my last annual address to you, I referred to the previous labors of the Society and their valuable results, particularly in the clearing up of a confused synonomy, and the arrangement of reliable fruit lists, which, however, will both need much further amendments as we progress in our knowledge of the varieties under trial from year to year. Your attention was also directed to the very great importance, amounting to a necessity, for us to render ourselves familiar with a knowledge of what is called vegetable physiology, some phases of which have been presented to you in a lecture upon plant life. This exceedingly interesting, and to fruit-growers almost indispensable, department of study has not by any means been exhausted; but I shall not, at this time, give it further consideration than to remind you of its value, and of its attractive interest to those who will but observe what is going on in the vegetable world around them, and urge you, individually and collectively, to pursue the investigation of this exceedingly interesting and important branch of study. You may rest assured it will bring its own reward, and amply repay you for all the time and labor bestowed upon it, by the greatly increased success of all your horticultural operations.

THE FRUIT CATALOGUES.

One of the topics of consideration at this meeting is the further improvement of the catalogue of fruits, upon which the society has already bestowed much labor. In this matter we must necessarily be progressive, and we may expect to make changes from time to time; but just now our labors in this direction are looked for with great anxiety by the committee of the AMERICAN POMOLOGICAL SOCIETY, to whom has been assigned the difficult task of arranging a general catalogue of fruits for the whole country, in accordance with the suggestions of our lamented friend Walker, long the chairman of the general fruit committee of that association, who was one of the first to discover the futility of attempting to arrange lists for "general cultivation," until we were more fully acquainted with the modifying influences of soil and climate, in different parts of our extended country.

ENTOMOLOGY.

The great prevalence of insects that are detrimental to vegetation must have been observed by you all. Those that affect our fruits injuriously are exceedingly numerous in some parts of the country, and appear to be increasing fearfully among us, while orchardists in other regions seem to have escaped their ravages. All should be interested, however, in learning how to abate this nuisance, and to do this we must observe their ways, study their habits, and look out for their natural enemies, that we may avail ourselves of these valuable allies, which are animals, birds, and even other predacious insects. We have had a bright example set us by our worthy Secretary, who has for many years been industriously directing the attention of fruit growers to the protection of their crops from these pests, and giving us valuable advice respecting them, in his own and other agricultural publications.

In some of the States this matter has been deemed of sufficient importance to employ and pay an entomologist to report from time to time upon this subject such information respecting the insects injurious to vegetation, as might be of value to the people; and we thus have continued reports from the State of New York, by Dr. Asa Fitch, and from Massachusetts we have the excellent report of the lamented Thaddeus W. Harris, which has been republished after revision by some of the best naturalists of the country. Private individuals in other sections are carrying on the good work of observation, on their own account, without State assistance; and we are glad to be able to assure you that we have some of these to the west of us, and that we look with hope for the aid of those who are engaged in these investigations in the Prairie State. In Ohio we have able men at different points who are rendering invaluable contributions to the general stock of knowledge in this department. So also in several of the eastern States there are gentlemen of scientific attainments who have devoted themselves to entomology, but this subject does not appear to have received the benefits of Government support to any considerable extent except in New York and Massachusetts. The Department of Agriculture at Washington, however, I am glad to assure you, has acknowledged the great importance of this branch of natural history, of Mr. Lawrence Glover, of whom it is sufficient to say that he is most industriously devoted to the laborious duties that have been devolved upon him, and that he has done already a great work for the farmers of the country. He has figured and *engraved* an immense number of insects. The impressions from his copperplates are displayed upon the walls of the Agricultural Museum of the Department at Washington, and constitute one of the most valuable contributions to that collection which the Commissioner of Agriculture is having grouped there for the advance of the great interest under his charge.

The work of Mr. Glover is of national importance, and should be presented to the farmers of the country by Congress as a gift to agriculture, which would prove of inestimable value. The colored engravings already make a most interesting and handsome display in the museum. There are sixty-three plates, upon which are about six thousand drawings of insects in the different stages of their existence. These are grouped according to their classification. These drawings, colored from nature, are exceedingly correct and life-like; they have been the labor of years. Mr. Glover has attempted to investigate as much as possible those insects that are most injurious to our crops, and thus his labors have a very practical usefulness; besides which, the admirable system adopted in the index, renders the collection invaluable to the farmer and gardener who may wish to learn the name, classification and remedies for any insect. Analogous in its value and objects is the museum of birds prepared by the same indefatigable naturalist, in which a list of the insect food found in the crop of each species is given, with the name of the bird, on the label attached to the specimen.

Another feature of this Agricultural museum at Washington, which cannot fail to attract the attention of every lover of pomology, is the collection of fruit models. These are exhibited in handsome glass cases, which contain accurate plaster or composition models of various fruits. These casts have the exact weight of the fruit, they give the precise form of the specimen from which they were taken, and they are colored from nature. They are so arranged as to exhibit the effects of soil and climate upon any given variety, by grouping all the varying specimens from different localities. This collection is now so placed as to be of invaluable service to the country; but though of national importance, it still continues the private property of its indefatigable author, who has spent a life of industry, with his private means, in this work, for which the nation owes him a debt of gratitude that should be paid by the national legislature. These objects should be purchased, and be preserved in the Agricultural Department, where they may form the nucleus of an economic museum that will be a most appropriate and most valuable section of that bureau.

The importance that these insect enemies are assuming, and the extent of their depredations, is not any longer to be questioned. These pests are among us, and in some parts of the country they abound in such numbers as to be a serious evil; indeed, certain branches of culture have even been abandoned on their account. That something be done, is imperatively demanded. But, you will ask, how shall it be done? You may say, and with great truth, the study of all their ways and habits is too great for us, since it is admitted, by those who know, that a life-time devoted to the subject is not sufficient to master an acquaintance with all the various forms of insect life that abound upon the earth; and further, that those who have distinguished themselves as entomologists have confined their studies to one or other of the great sub-divisions of the classifications of insects. All this is true; and yet you are urged to study entomology. It is insisted upon that we, the farmers, the gardeners and the pomologists of the country, who owe so much to science and to the contributions which her devotees are constantly adding to the cause of human knowledge, should also render our mite to the common stock. This our constant association with nature enables us to do most satisfactorily, if we only have our eyes educated to observe the interesting facts about us. While in his closet the professor of the science is plodding in the greater depths of classification, and tracing analogies, we, his pupils, may be active students of the open book of nature, making daily observations of little things that are transpiring under our eyes, and in this way we may render great service to the professor, and through him to the world.

To do this, and to prevent us from committing serious errors in attempts to rid ourselves of these insect enemies, a very little knowledge will be found necessary—not more than could be imparted by the teacher in any log school-house to his pupils with the happiest effect. Children are excellent observers, and readily become naturalists; all that is needed is to direct their attention to the subject by means of a few bold outline drawings that could be explained to them by a teacher of common intelligence, who would only require illustrations of characteristic insects of the several orders. These should represent the insects in their different stages of transformation. For you, my friends, any elementary work will give you the information necessary to distinguish these orders, so that you may readily acquire a sufficient knowledge to observe judiciously, and to distinguish between those creatures that are injurious and those that are beneficial to man.

The importance of constant and close observation of little things has already been pointed out to you. Thus much, at least, all cultivators should endeavor to master. It is not necessary that we should be scientific, but a certain amount of systematic knowledge will be found of great service in preparing us to observe properly the wonderful creations by which we are surrounded, and will enable us intelligently to communicate the results of our observations to others. We flatter ourselves, also, that the simplest facts which we can notice may be of the greatest importance to the cause. In our open field of labor we may often see what the learned professor has failed to discover in his more limited range of observation, and with his more numerous objects of investigation, and thus we may make valuable contributions.

BIRDS.

The beautiful harmonies of the creation will everywhere be observed as we pursue our study of natural objects, and at every step of our advance we shall be struck with wonder and delight at the evidence of design which is characteristic of the works of the All-Wise Creator. Each tiny fly, every caterpillar, every bird and animal, as well as every plant, has its mission to fulfill as well as man, who claims to be the ruler and superior of them all. Together they were wisely designed to make up a harmonious group. This harmony, and the wonderful system of checks and balances wisely provided by the Creator, is, however, constantly disturbed by man in his interference with nature. Hence it becomes our duty to investigate these subjects, and no longer blindly to interfere with these beautiful harmonies, as has been so often done.

The birds are provided to keep certain insects in check. Many of them consume immense numbers of these creatures, and when we attempt their destruction because they too have claimed a share of our crops, we are sure to suffer from the multiplication of some insect foes that they were designed to keep in subjection. This is eminently true of the crows and blackbirds, and when the Legislature of one of the Eastern States was induced to offer a bounty for the heads of these useful creatures, certain insects soon increased to such an extent as to ruin the meadows, and the farmers were obliged to import hay to make up the deficiency.

There are many reasons why we should preserve the feathered visitants of our groves and orchards, and gladly would I attempt to entertain you with arguments in their behalf, but prefer to quote a popular poet, and repeat to you his lines, entitled "The Birds of Killingworth."*

FRUIT DESCRIPTIONS.

Allow me to take this occasion to direct the attention of the Society to a point which, perhaps, some of you may think does not personally concern you who are not pomological writers. You are all, however, I trust, pomological readers and talkers; therefore, anything relating to the methods and terms used in the descriptions of your favorite fruits will be of important concern to you. You may have observed that the descriptions we often meet with in our investigations, when endeavoring to identify a fruit, are exceedingly unsatisfactory. This is owing oftentimes to their brevity, and to the want of system in the writings we consult. We also observe a degree of vagueness and confusion in many of these descriptions which it would be very desirable to avoid, if possible. While it is admitted that our descriptions should be as full and distinct and as systematic as possible, we should endeavor to avoid making them too prolix and tedious, as well as too wordy and extended.

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*The reader is referred to this little poem.

This subject has attracted the attention of the Fruit-Growers' Society of Eastern Pennsylvania, a sister association from whom we may be willing to learn, and I have the pleasure of laying before you their report upon this subject, which has been sent to some of us "for advice and criticism," which I hope you will bestow upon the communication.

Formula of Description of the Fruit-Growers' Society of Eastern Pennsylvania.

SYNOPSIS OF ARRANGEMENT.

DIV. 1ST.—ORIGIN AND HISTORY.

This being an important auxiliary in determining the relative value of fruits generally, as is instanced more particularly in grapes, a correct and reliable record of each variety should be traced out, and recorded under this heading. It is also especially desirable, in this connexion, to ascertain the parents of each whenever possible, as well as the native habitat, etc.

This department is common to all kinds of fruits.

DIV. 2D.—FORM AND HABIT OF TREE OR PLANT.

Although much neglected, this department is beyond a doubt of exceeding great value in deciding upon the correct nomenclature of our fruits. The very many well-marked points of difference that have hitherto been deemed of trivial importance, are, when closely investigated, more reliable and trustworthy, in many instances, than even the external appearance of the fruit itself.

CLASS I.—*Young Bark.*

Sec. a. Color.
" b. Peculiarities.

CLASS II.—*Blossoms.*

Sec. a. Size.
" b. Color.
" c. Shape.
" d. Arrangement.

CLASS III.—*Leaf.*

Sec. a. Size.
" b. Color.
" c. Shape.
" d. Arrangement.
" e. Petiole or Leaf-Stem.
" f. Marked peculiarities.

CLASS IV.—*Branches.*

Sec. a. Inclination.
" b. Shape.
Sec. c. Length of Internodes as in the Grape
" d. Marked peculiarities.

CLASS V.—*Wood-Buds.*

Sec. a. Size.
" b. Color.
" c. Shape.

CLASS V.—*Spines.*

Sec. a. Size.
" b. Color.
" c. Number.

CLASS VII.—*Fruit-Spurs.*

Sec. a. Character.

CLASS VIII.—*Roots.*

Sec. a. Form and Arrangement.

CLASS IX.—*General Outline of Tree.*

DIV. 3D.—EXTERNAL CHARACTERISTICS OF FRUITS.

These are the peculiarities or variations that appeal to the eye alone, and as a general rule, are less reliable in judging a fruit than the following division. They are, however, very necessary assistants, and should receive due care and attention. As almost every variety is more or less subject to changes in size, form and color, these should in all cases be accurately recorded.

CLASS I.—*Appertaining to all Fruits.*

Sec. a. Size.
" b. Color.
" c. Shape.
" d. Skin.
" e. Peduncle or fruit-stalk.
" f. Calyx.
" g. Cavity (surrounding peduncle).
Sec. h. Basin (surrounding calyx).
" i. Marked peculiarities.

CLASS II.—*Appertaining particularly to Grapes and Currants.*

Sec a. Size of bunch.
" b. Shape of bunch.
" c. Compactness of bunch.

DIV. 4TH.—INTERNAL CHARACTERISTICS OF FRUITS.

These are the criteria that appeal to the palate and nostril, in addition to the eye, and may be entitled to precedence in detecting all our varieties of fruit, being less liable to variation than most of the outward *signs* or *marks*.

CLASS I.—*Including all Fruits.*

Sec. a. Flesh—* Color.
do ** Consistency.
" b. Juice.
" c. Flavor.
" d. Fragrance.
Sec. e. Core.
" f. Seeds—* Size.
do ** Shape.
do *** Color.
do **** Number.

DIV. 5TH.—MISCELLANEOUS CHARACTERISTICS OF FRUITS.

In addition to the foregoing specified list of peculiarities, there are other characteristics that are worthy of notice, viz: *Productiveness, rapidity of growth, early or late fruitfulness, average ripening season*, and *keeping qualities of fruits.* As these vary, however, so widely in different localities, and on adverse soils, no definite standard can be given to serve as an infallible guide: but the variations should be accurately recorded whenever ascertained.

This you will think is surely full enough, and yet what portion will you exclude? As this is a matter that is deemed of great importance and one which deeply interests me, I shall feel greatly obliged to the members present if they will be so good as to take up the consideration of the subject at some time during our sessions of this meeting of the society. With your permission I will again submit my own plan of describing fruits, in which system and minutiæ are combined, and a regular order is always followed. Beginning with the Tree characters, I give the general form, vigor and productiveness; next, the peculiarities of limb, twig and foliage, with the blossoms when these have any marked characteristics. In scribing the fruit, the external characters first claim attention, and are taken up in the following order: shape, size, surface, color and dots. In the apple and pear the basin is next observed and characters noted, with any peculiarities connected with the eye, or the cavity inclosed by the calyx, and the characters of the segments. The other extremity of the fruit is then explored as to its form and other characters, and the length, size, &c., of the stem are observed.

We now come to investigate the nature of the internal characters, a section being made through the middle vertically exposes the flesh, core and seeds; the characters of the capsule are first examined, as to size, form and openness, and the number and peculiarities of the seeds. The color of the flesh, its texture and juiciness, are noted; the latter quality is always tested by the teeth, when the palate gives us an account of the degree of acidity, or sweetness and flavor. The investigator is now prepared to pronounce judgment: having the testimony of his organs of touch, sight, taste and smell, he can pronounce his decision upon the quality, and should next specify the particular uses to which the fruit is especially adapted; whether for the table, as a dessert fruit; for the kitchen, as baking, stewing, or for drying; and also whether it be particularly suited for market, or for the amateur. The season of ripening should be noted in this place, with any remark as to qualities not already provided for, and then the history of the variety may very appropriately be alluded to.

A similar system is adopted with other fruits, modified to suit their several peculiiarties.

CLASSIFICATION.

Analogous to this is the subject of classification of fruits, which, with our extended lists, has now become a matter of urgent necessity. Allow me to present a combination and modification of what appear some of the best suggestions of those pomologists who have attempted a classification.

The need of a good systematic arrangement of our fruits is more and more felt as our catalogues have become more and more extended. With a small list of descriptions we may afford to read, one after another to the end, with specimen in hand, in our endeavor to make out its identification; not so, however, when the list extends to several hundreds. Besides, we are never sure that our author has described the particular variety in question. Had we its name, we might refer to the index and find the page upon which we could read the description and compare it with the fruit. But we do not desire to criticise the book, our object is to identify the fruit, and we do not have the name to guide us: we are perfectly at sea, with an unknown specimen and a voluminous record; at sea, without star or compass to direct us, and we must grope along in the dark, unless we have some classification to guide us. Upon what principle shall this classification be founded? The common alphabetical arrangement may be well for the known names of fruits, though in itself entirely arbitrary, and involving the confusion of a multitudinous synonymy. The classification, by season and by size, has its difficulties; in the uncertainty and variation of both these characters; in the different soils and climates of our extended country. A subdivision and grouping of fruits by their quality of excellence is not only unreliable but also entirely arbitrary, and subject to great diversity of opinion with the various tastes of different individuals.

Among our American writers, who deservedly stand prominent as pomologists, the most satisfactory production in this respect is the little work of J. J. Thomas, in which is found a most satisfactory classification. But Thomas' book, with all its unquestioned merits, contains only a small portion of the fruits that are extensively cultivated in this country, and hence the need of classification is less felt than it would be in a list of several hundreds; still, no one who has realized the advantages to be derived from the simple and clear subdivisions of this author, would ever be satisfied without some classification. He makes three great divisions of apples, according to their period of ripening, as the *Summer*, *Autumn* and *Winter:* these are each divided into two classes, characterized by their flavor as *sweet* apples, and those with more or less acidity; and each of these classes is subdivided into two sections, according to their color; as, striped with red, or not striped—so that in this arrangement we have twenty-one groups, and, with specimen in hand, and the synopsis of arrangement open before us, we may at once decide in which of these groups of moderate dimensions we may look to find the description of our specimen if it be contained. The labor of searching is thus greatly diminished. It is true, that here, as in all classification, we shall find our group lapping over upon another.

The Germans have made many attempts to effect a suitable classification of fruits: Christ, Diel, Dochmal, Manger and Sickler have been engaged in this work, and Diel's synopsis, though far from perfect, has been generally adopted. He makes seven classes, with orders under each. Dochmal, a later writer, has modified this, by making two sections, according to the shape, whether *angular* or *spherical*, and four classes, also based upon their form. Robert Hogg in his *British Pomology*, an excellent account of the apples cultivated in England, has given a modification, which answers a good purpose for classification. He makes three great sections, according to season—*Summer*, *Autumn* and *Winter*. Each of these is subdivided into two classes, according to the shape: 1st. *Round*, *roundish* or *oblate;* and, 2d. *Oblong*, *conical*, *oval* or *ovate*. These again are grouped according to their colors: A, pale; B, striped; C, red; and D, russet.

After long and close consideration and study of this subject, I have prepared the following guide for the CLASSIFICATION OF APPLES, consisting of four *classes*, based upon their shape, with two *orders*, distinguished by the modifications of form, causing the fruits to be regular or irregular, and angular. Each of these may contain two *sections*, characterized by flavor as sweet and sour, and each of these may again be sub-divided into three *sub-sections* that are based upon color :

CLASS I.—OBLATE or FLAT, having the axis shorter than the transverse diameter.

1st ORDER—Regular.

Section 1—Sweet.

Section 2—Sour.

Sub-Section 1—Pale, or blushed more or less, but self-colored, and not striped.

Sub-Section 2—Striped or splashed.

Sub-Section 3—Russeted.

2d ORDER—Angular, more or less ribbed, or otherwise uneven.

Sections 1 and 2.

Sub-Sections, as above.

CLASS II.—CONICAL; tapering towards the eye decidedly.

ORDERS 1 and 2.

Sections 1 and 2.

Sub-Sections 1, 2, 3, as above.

CLASS III.—GLOBULAR, nearly spherical, the axial and transverse diameters about equal. The ends are often truncated, when the fruit appears cylindrical, or globular oblate.

ORDERS, *Sections*, and *Sub-Sections*, as above.

CLASS IV.—OBLONG, in which the axis is longer than the transverse diameter.

ORDERS, *Sections* and *Sub-Sections*, as above.

To this attempt at a classification I desire to call the attention of my fellow-members of this Society, hoping that they will frankly give me their views at some convenient period of these sessions. There is a topic to which I desire to direct the attention of the members this Society; I refer to what has been termed *Industrial Education*. It may be objected to the introduction of such a subject; that we are horticulturists and not educators. True, but as brothers and fathers, as members of society, as citizens, and as a part of the people, we may and should feel the deepest interest in the expenditure of the people's money, in the proper disposition of the noble grant of the General Government, which has been most generously appropriated for the education of the industrial classes, of which we form a part.

You will at once perceive that I refer to the Congressional grant o public lands to the several States for the endowment and support of agricultural and mechanical schools, and I trust you will feel a deep interest in this subject. As cultivators of the soil, we must all of us have realized the need of instruction suitable for our vocation, and consequently, while some of us have suffered the want of education, others have ascertained the impossibility of obtaining the kind of knowledge we desired in the classical schools and colleges of the country, nearly all of which, being based upon the idea of preparing young men for what are called the *learned professions*, compel their pupils to spend years of their precious time in vainly attempting the acquisition of the dead languages and similar studies, which, how desirable soever they may be, can never be of any real practical value to the great majority of us in the business of life, and which constantly act unfavorably upon the majority of our youth, either by keeping them away from the schools, by forcing them into the already crowded ranks of the professions, for which they may be naturally unfitted, or by crowding out of the course of study those other branches of knowledge which are eminently calculated for the improvement of the faculties of those of our youth who are destined to fill the more numerous ranks of agricultural and mechanical labor. Too often, indeed, we find that a college course wholly unfits our young men for future usefulness, by giving them a distaste for all the active pursuits of life. The difficulty of obtaining a suitable education is one which is too patent to have escaped our attention, and too important to be overlooked by us.

Our brethren in Illinois very early bestirred themselves in this matter, and it is to them and to their efforts, long and perseveringly continued, that we now owe the results in the action of a liberal and enlightened Congress. After considerable hesitation and delay the Legislature of Ohio has at length taken the first steps toward securing for us this noble endowment; they have accepted the grant, and thus they have agreed to comply with the requisitions of the law, to establish an industrial school within the specified period. I wish you, my friends, and every workingman in the State, to realize that this grant is for our benefit, and I entreat you all to watch closely the action of our Legislature in regard to its disposition. There will be plenty of kind offers to relieve the authorities of the trouble and responsibilities connected with the execution of the trust that has been assumed.

Collegiate institutions will gladly seize upon the fund and convert it from its legitimate purposes. They are already in the field. Those very concerns that have failed to supply the kind of instruction which the people demand, and on account of whose deficiencies this grant has been made, will eagerly rush forward and offer to engraft upon their stocks the necessary scions, as additional branches of instruction. Listen not to their proposals—turn a deaf ear to their blandishments; they will only divert the fund from its legitimate uses. Then, again, there are so many claimants to come forward, that the noble bequest will be frittered away to nothing, and its object will be lost.

Let us have one or two really good practical schools of the character contemplated by those who petitioned for industrial education, and as it was intended by the Congress which granted the endowment. Let the schools be provided particularly for the industrial classes, and let them be especially adapted to the educational wants of those classes, the *agricultural* and the *mechanical*.

It may be considered premature to pretend now to fix the course of study, though suggestions have already been made. My own impressions are that the greatest amount of good might be effected by establishing an institution where thorough courses of lectures could be given during the winter months, to which our young and even our middle aged farmers and mechanics could go to receive instructions in the principles of their several vocations. This plan would seem to promise more immediate and more extended usefulness than the common idea of a school for boys. We have our common schools, our high schools and our academies all over the country to impart rudiments of knowledge; in our work-shops and upon our farms the youth may familiarize themselves with the practical details of all the various operations to be performed by them in every-day life. When thus qualified, they are now prepared to listen to the predictions of suitable teachers, from whom they may learn the *principles of science* which should guide them in all their operations, and then they will return to their respective fields of labor to apply in practice these principles of action.

Such a plan, it appears to me, would enable our rulers, and those into whose hands this important matter is entrusted, to bring about the most immediate and satisfactory results. I know that others who have devoted much thought to this subject, have advocated the purchase of large tracts of land, the erection of stately buildings, the organization of noble faculties of learned professors, and the establishment of immense boarding schools for mere boys, in which the elementary branches shall be taught. Shall we not thus bring our industrial education down to the level of the common schools of the country, which are already amply provided for? Do we not thus directly interfere with their usefulness, and shall we not thus lose the great benefit of our fund which is intended for the higher education of the working masses of the country? On the contrary, by beginning where the common schools leave off, we encourage these favorite institutions, and offer to the aspiring youth higher aims than are there attainable, and advance them in the knowledge of the principles of the pursuits they may choose for their life-work.

If we would learn by the experience of others, we might see the advantages of such a plan as has been here recommended—that of imparting instruction by lectures and conversations illustrating the principles and practices of art as guided by science. In teaching medicine and law, for instance, the professors require in the student a full preliminary education, not only in classical studies, but a considerable knowledge of the subjects to be discussed in the lecture-rooms also have been obtained in the office of the practitioner, either of law or medicine, before the student is admitted into the college to attend the lectures. And while practical anatomy and surgery can only be acquired in the dissecting rooms, while the practical investigation of disease, administering of physic, and the compounding of medicines, can only be learned in the hospitals and in the apothecary shops, and practical chemistry in the working laboratory of the colleges; so in our industrial institutions of learning for the people, there will yet remain a great deal of practical work to be done.

If we would succeed in our efforts, especially in giving the highest and greatest amount of useful information to our pupils, we must guard against the very common error of beginning too low. Let our pupils acquire the A B C of manipulations on the farm or in the shop before they come to these schools. We shall find enough to do in imparting such kinds of practice as they cannot acquire at home, and in giving them a knowledge of the principles that are to guide them in their operations, and which they may apply for themselves when they return to their respective fields of labor.

Look at the history of our so-called Agricultural Colleges. They have too often proved failures, and from two leading reasons, as I firmly believe. The first is the one already alluded to, the want of requiring a proper qualification on the part of the pupils, taking them too young, and attempting to give them preliminary instruction, not only in books, but also in the details of practice, even in some instances descending to the lowest and most menial services, which can never be so well acquired anywhere as in the shop or upon the home farm; but when attempted at the college they have too often disgusted the pupil who is thirsting for knowledge of a different kind, and who chafes at the drudgery of such labors. Another, and a most serious cause of failure on the part of these institutions, has grown out of the injudicious appointments that have been made of the teachers who were put in control. These have been too often selected, not from practical walks of real life, but from the unreal and the artificial strata of society, and had already proved themselves unpracticable, who were unsuccessful in whatever line of duty they attempted to fulfil. Such are not the men who are needed to originate new plans of teaching in new paths of instruction. For our great enterprise we must have clear heads, and willing hearts, who can cast loose from old trammels and start off upon the new line of action which is opened before them.

This course of instruction has so different an object that it must needs require a different plan from the old scholastic ideas that are based upon the beauties of the digamma, Greek roots and gerunds, which, to some of us, were once so captivating.

Since the days of Follenberg we have been taking more liberal views of education, becoming more practical in our plans for the training of the minds of youth; nor can it be doubted that we shall find men qualified for the task before them—if not at once successful, they must learn their duties and apply themselves to the task with a determination to succeed. Young men who are less closely wedded to old ways than those who have long run in the deeply worn ruts of an old system, will be most likely to prove successful, and perhaps, under a good leader, determined young teachers, even without previous experience, will sometimes prove the most successful.

But it is yet premature to lay down the course of study upon which the selection of teachers will depend. Let it be essentially a practical course, with broad foundations of the sciences that are needed in real life. The details, and in many cases the very text-books, must be evolved from the attendant circumstances and the growing wants of the course of instruction to be given. A good foundation should have been acquired by the pupils in mathematics as far as arithmetic, and the elements of algebra and geometry. A familiar acquaintance with our own language should also be required, so as to enable the pupils to read the productions of another intelligently, understandingly to themselves and agreeably to an audience, as well as to express their own thoughts, vocally or upon paper, with ease and perspicuity. With such a preliminary education they would be prepared to appreciate and appropriate the discussions of their teachers.

The Cincinnati Horticultural Society has adopted the following resolutions:

1st. That we rejoice at the action of our Legislature in accepting the Congressional grant of 650,000 acres of land for the endowment and support of industrial education.

2d. That we trust our Legislature may be wisely directed in the appropriation of this noble grant, so that it shall be productive of the beneficial results for which it was bestowed, and for which it was asked.

3d. That we believe the intention of Congress cannot be carried out by bestowing the endowment upon the State Universities, nor other collegiate institutions already organized under the old academic system.

4th. That we utterly deprecate the subdivision of this fund among the several sectarian and other colleges of the State, which may lay claim to a share in the benefits of the grant, upon the specious plea of establishing professorships of agriculture and mechanics.

5th. That we earnestly entreat our law-makers, at an early day, to establish within our borders an institution for the industrial instruction of our people, which shall furnish the greatest possible amount of instruction of such a kind as shall be in accordance with the expressed desire of the numerous memorialists of the West, who have asked for the grant, and with the spirit of an enlightened Congress that has appropriated this noble behest to the necessities of our industrial interests.

FINALE.

Before bringing this annual talk to a close, it is but just to you, my fellow-workers, for me to refer with pride, and also with humility, to the eminent position to which, by your kindness, I have for too long a time been elevated. To direct the discussions of so useful a society as ours, is no small honor; and it is one which is acknowledged not only by the unworthy incumbent, but by others in various parts of the country, where, indeed, your partiality toward him has proved a passport to the good graces of eminent men. Trusting that your kindness will prove to be of sufficient compass to enable you to overlook all the shortcomings which may have been observed in your presiding officer, allow him to thank you for your agreeable co-operation in all matters relating to the conducting of our deliberations; and now, at the close of his term of service, he returns the mallet of office to those who conferred it upon him, fondly hoping that, for the good of the Society and of our favorite pomology, you will select a more efficient officer as his successor.

VISIT OF AD INTERIM COMMITTEE TO PITTSBURGH, PA.

The following are the remarks referred to on page 57:

Your committee felt it desirable to cross the boundaries of the State, in the course of their investigations into the condition of summer fruits, and they accordingly report to the Society the result of their observations of the progress made by J. Knox, at his celebrated fruit farm. This is situated upon Coal Hill, south of the Monongahela river, and within reach of the smoky atmosphere of that great manufacturing city, Pittsburgh, which boasts of her thousands of chimneys which are constantly pouring forth their sulphurous and carbonaceous vapors, that, by some, are supposed to exert a happy influence upon vegetation.

The soil of this farm is admirable, being a calcareous loamy clay, based upon the sandstones and shales of the coal measures that are here largely developed. The limestone lands of this formation furnish their quota of calcareous material to the soil resulting from the natural detritus of the rocks; and stony fragments are often of frequent occurrence. Far below the surface the valuable deposit of coal is being removed, which may be considered to furnish a magnificent underdrainage of the whole, and which, indeed, has been found to exert a very decided effect upon some of the wells and springs that have failed of their wonted supply of the liquid element which is so important to animal and vegetable life. The substratum of clay, near the surface soil, however, is of an exceedingly retentive character, and real, artificial underdraining with tile is found very efficacious, and, in some places, necessary. The calcareo-argillaceous character of the soil is manifested very clearly in the growth of the Poa compressa, a valuable pasture grass, known in some parts of this State as the Pennsylvania Blue-grass, and which, as it constitutes the great merit of much of the richest pasturage of that State, is beginning also to be properly appreciated by the graziers of Ohio. To us pomologists it is a matter of interest to know that it is associated with the culture of the grape, in that it is incident to the clay lands which are generally selected for vineyards in the north part of our State. Of the aspect, nothing more need be said than that a gently undulating upland surface presents its inclinations in every direction to the sky.

In the month of June your committee presented themselves at the farm and sale-rooms of Mr. Knox, to see for themselves that whereof so much had been heard. Several horticulturists accompanied and met them, who were also interested in the same quest; and it may be said that all were equally astonished and delighted with the result.

Four things struck all the visitors as especially worthy of note: The modes of preparation and culture of the soil, the varieties under culture and trial, the wonderfully abundant product of magnificent berries, and the excellent and successful mode of harvesting and marketing the fruit, all of which may very properly be introduced into this report for the benefit of our fellow-members.

First then for the mode of preparing the soil. This is simple, but thorough. The ground is deeply plowed and subsoiled twice in the autumn, left exposed to the meliorating influence of the winter's frosts, and again deeply stirred in the spring, before planting. Manure is not applied to any considerable extent, except upon such spots as may happen to have been considerably impoverished by previous culture. The too great enriching of the soil by this means has been thought to render the berries misshapen, and is known also to produce a too rampant growth of foliage. It is desirable to have the plants strong and thrifty, but there must be preserved a due balance between the wood-growth and the fruit. The plants are set out in the spring as early as is convenient. The runners produced the previous season from plants kept especially for this purpose, are selected for making the plantation, for it will appear that the fruit-producing vines are not allowed to form any runners. The plants are set about a foot apart, in rows that are eighteen inches wide; three rows constitute a bed, when a space of two feet and a half is left for a path between the beds. These are kept perfectly clear by hand culture during the whole season, so as to encourage their utmost growth, and the result in the autumn is a continuous mass of foliage springing from a group of spurs or points that are to blossom and fruit in the greatest profusion the following years. This is not merely the result of thorough preparation of the soil, and clean culture during the season, but should also be attributed to the effect of constant summer pruning, or the removal of all runners, which coustitute the wood-growth of the strawberry plant, and which exhaust the original stock if allowed to remain. On the contrary, if persistently cut back as soon as they appear, the plants are rendered stocky, and produce a number of points or fruit-spurs, making what gardeners call a stool, having many crowns in each plant. This your committee consider one of the main causes of the wonderful fruitage they have witnessed upon these grounds, and they have concluded that the success of Mr. Knox is due rather to himself and to his well-guided efforts, than to any accidental circumstances of soil and situation, though these have been shown to be very good. A heavy mulching of straw is applied on the approach of cold weather, which protects the plants from the injurious effects of freezing and thawing in the winter, and keeps the fruit from the dirt the next summer, as well as prevents the growth of weeds.

VARIETIES.

All these have been, or are being tested by Mr. Knox, as soon as introduced; for he has great enterprise, and he too well understands the importance of having the very best sorts to be satisfied with any other. Every new variety of training character is at once brought upon the grounds and thoroughly tested. Of the older sorts, the Triumph de Gand, Wilson, Kitley's Goliath, Victoria, Golden Seeded, Fillmore, British Queen, etc., are among the favorites. Some of these are made to yield enormous crops by the mode of treatment adopted here, and already mentioned. The development of the berries is magnificent; nor is it only a few specimens, but wagon loads are daily taken to the market, which would be worthy of a place on the tables of any horticultural society. In this respect, however, there is a great difference among the varieties, as to the uniformity of the product. The Fillmore attracted great attention from its handsome appearance, rich color, regular form, and uniformly good size. The Wilson was enormously productive, as usual, but the early berries only were of first class as to siez.

The variety that attracted most attention was one that was neither new nor old, though in its deportment and appearance it was a novelty to your Committee and to all visitors. The conventional indication, as from the private memorandum of the farm record, was the number 700. This happened to be attached to the stake opposite to some plants supposed to be the Bonti St. Julien. Among these this remarkable berry made its appearance. It was soon discovered to be different from that variety, but its proper identity did not so readily appear, hence it continued to be designated by its number. The remarkable beauty, size and productiveness of the fruit, and the healthy appearance of the plant, induced Mr. Knox to extend his plantations annually, as fast as he could multiply the runners, and in the meantime he has been endeavoring to discover its true name. One of your Committee, on meeting the Jucunda, was struck with the resemblance existing between the plants of that variety and those of the so-called 700, and were disposed to assert an identity between them. Further observations have almost conclusively confirmed this, and perhaps it may now be asserted that they are the same. To Mr. Knox, however, the merit is due of introducing to public notice this very beautiful and magnificent fruit, for others, who have cultivated the Jucunda for years, do not appear to have discovered its great merits. So satisfactory have been the results upon this farm, that Mr. Knox has planted twelve acres the present season with this variety, and has used every plantlet that he could produce in his beds appropriated to their propagation.

The Russell promises well, being a pistillate variety of great vigor, an abundant bearer of large, handsome fruit, not so regular, so firm nor so brilliant as the 700, but of a good flavor, though rather soft for distant transportation. The Buffalo is exceedingly like it in all its leading characters, so much so that many have supposed them identical. This, however, we must leave as an open question for the present, as there is a want of unanimity among ourselves upon this point. Both these varieties are very readily impregnated.

La Constant is very promising and attracts all observers by its appearance, and especially by its flavor.

French's Seedling, which has attracted a great deal of attention in some of the Eastern cities, here appears to be so much like the famous Bartlett, which we have apprehended to be only another name for the old Boston Pine, that your Committee have almost concluded to consider these three as synonyms. In this we may be mistaken, but there does not appear to be a sufficient difference among them to make it desirable to cultivate more than one; nor can we recommend either as of sufficient value as a market fruit to justify its extensive planting.

A great many varieties were found upon these grounds. Some of them were old and well known, while others are new and are still on trial. Among the latter are a few varieties of great promise, but others have not yet been sufficiently tested for us to decide upon their merits.

HARVESTING, MARKETING.

Your Committee were more than ever satisfied, while inspecting the arrangements at this establishment, of the importance of order, system and care in the harvesting of fruits, so as to have them presented in the best possible condition to the consumer. The fruit is chiefly gathered in the morning. The laborers, who are mostly females, are divided into squads, which are each attended by a supervisor, whose duty it is to supply the empty vessels and remove the full ones to the nearest depot. These he examines carefully to see that they are in proper condition. Each picker is supplied with two boxes or baskets, into which the berries are placed, according to their quality as first or second. These boxes contain either a pint or a quart, and when brought together at the depot in the field they are packed into larger boxes, that are carried to the cellar or are at once placed in the wagon for transportation to the city. These are so arranged that the fruit shall not be either compressed nor jostled, and the whole is thoroughly ventilated by appropriate openings. The greatest care is taken in the picking and placing in the boxes. Each berry is taken by its stem, so as to avoid crushing and bruising, and so laid in the basket as to appear to the best advantage. Hand-barrows are used upon the farm, and spring-wagons upon the road, so that when the fruit reaches the store or the market-house, it is in the best condition and presents the most beautiful appearance.

Your Committee feel bound to assert that they have never witnessed so fine an exhibition of plants and fruit as they found both upon the grounds and at the counters and tables of the sale establishment in the city.

TREASURER'S REPORT—1864.

Balance on hand from last report	$102 97	
Received fees of members at Columbus and Cleveland	10 00	
“ “ “ by President	37 00	
“ “ “ by letter, &c	8 00	
“ “ “ at annual meeting	56 00	
“ appropriation from State	300 00	
		$513 97
Paid expenses of President at Columbus compiling report	$10 00	
“ “ Secretary, trip to Columbus, correcting proof, &c	12 00	
“ for covering and stitching 400 copies report	8 00	
“ for wrapping and postage on 200 copies mailed	4 75	
“ for letter paper and printing heads	4 50	
“ for printing circulars, &c., for annual meeting	9 25	
“ for envelopes and postage for 300 circulars	8 00	
“ for express and drayage at annual meeting	5 35	
“ for fuel, gas, and cleaning hall for annual meeting	6 50	
“ for postage on letters, &c., for year	3 00	
“ expenses of Committee Ad-Interim at Cincinnati	30 50	
“ members of Committee to Cincinnati, Pittsburg and Cleveland, viz.: Dr. Warder, $10.00; J. Austin Scott, $22.60; M. B. Bateham, $45.50; J. R. Miller, $26.85; G. W. Campbell, $40.75; S. B. Marshall, $48.55; F. R. Elliott, $20.00	214 25	
		$316 10
March 1, 1865. Balance on hand		$197 87

☞ *Members of the Society* who have not paid their annual fee ($1) for 1864, are requested to remit the same by mail to the Treasurer; and if they do not expect to be present at the annual meeting, they can at the same time remit for the year 1865.

Address, M. B. BATEHAM,
Painesville, Ohio.

April, 1865.

OFFICERS AND MEMBERS

OF THE

OHIO POMOLOGICAL SOCIETY, 1865.

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Vice-President—G. W. CAMPBELL, Delaware.
Secretary and Treasurer—M. B. BATEHAM, Painesville.

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Members of the Committee Ad-Interim with the above Officers.

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Israel Hall, Toledo.
D. D. Gardner, “
Chas. Lenk, “
A. W. Maddocks, “
J. Huber, “
Frederick Bissell, Toledo.
Dr. S. S. Lungren, “
W. J. McMillan, “
W. E. Earl, “
Wm. Rawle, “
F. A. Jones, “
H. H. G. Smith, “
Geo. Baker, “
A. Fahnestock “
M. Shoemaker, “
P. H. Shaw, “
F. L. Nichols, “
Henry Bennett, “
E. T. Mortimer, “
W. W. Jones, “
Geo. E. Pomeroy, “
Samuel Bement, “
S. A. Raymond, Toledo.
N. L. Woods, Smithfield.
Jos. Morris, Cardington.
C. W. Ensign, Madison, Lake Co.
E. F. Ensign, “
Geo. T. Cook, “
H. C. Phillips, Berlin Heights.
M. F. Cowdery, Sandusky.
J. S. Cowdery, “
D. C. Richmond, “
H. B. Lum, “
H. T. Dewey, “
W. Z. Barney, “
Jno. McElvy “
J. C. Coe, Sidney, Shelby Co.
Geo. Hapgood, Warren.
Lewis Nicholson, East Rockport.
Dr. J. P. Kirtland, “
F. G. Hill, Dallasburg, Warren Co.
Henry Hefflebower, Montclovia, Lucas Co.
Chas. Carpenter, Kelley's Island.
Chas. Kelley, “
H. P. McMaster, Leonardsburg.
H. R. Kinney, Portsmouth.
W. B. Russell, “
Stephen Boalt, Norwalk.
Giles Boalt, “
E. S. Stowe, Milan.
Jas. Donipace, Perrysburg.
E. Luce, Ashtabula.
A. D. Strong, “
Wm. Wyld, Brownhelm, Lorain Co.
Chas. Downing, Newburgh, N. Y.
Alvah Bushnell, Iona, near Peekskill, N. Y.
S. S. Cole, Knoxville, Ill.
G. W. Cole, Canton, Ill.
H. Berst, Erie, Pa.
Wm. Smith, Geneva, N. Y.
Erastus Spencer, Claridon, Geauga Co.
Geo. W. Dean, Kent, Portage Co.
J. L. Green, Granger, Medina Co.
J. M. Curtis, Brooklyn, Cuyahoga Co.
L. Green, Perry, Lake Co.

LAWS OF OHIO

FOR THE

ENCOURAGEMENT OF AGRICULTURE.

AN ACT

For the encouragement of Agriculture.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That whenever thirty or more persons, residents of any county or district embracing two counties of this State, shall organize themselves into a society for the improvement of agriculture within said county or district, and shall have adopted a constitution and by-laws, agreeably to the rules and regulations to be furnished by the Ohio State Board of Agriculture, hereinafter created, and shall have appointed the usual and proper officers; and when the said society shall have raised and paid to their treasurer, by voluntary subscription, or by fees imposed upon its members, any sum of money in each year, not less than fifty dollars; and whenever the president of said society shall certify to the respective county auditors, the amount thus paid, attested by the oath of the treasurer before a magistrate, it shall be the duty of the said county auditors, embraced within the district in which such society shall be organized, to draw an order on the treasurer of the respective county in favor of the president and treasurer of said society, for a sum equal to the amount thus raised; provided it does not exceed half a cent to each inhabitant of the said county, upon the basis of the last previous national census, but not to exceed in any county the sum of two hundred dollars, and it shall be the duty of the treasurer of said county to pay the same.

SEC. 2. That it shall be the duty of the several county or district societies which may be formed under the provisions of the preceding section, during the continuance of this act, annually to offer and award premiums for the improvement of soils, tillage, crops, manures, implements, stock, articles of domestic industry, and such other articles, productions and improvements, as they may deem proper, and may perform all such acts as they may deem best calculated to promote the agricultural and the household manufacturing interests of the district and of the State; and it shall also be their duty so to regulate the amount of premiums and the different grades of the same, as that it shall be competent for small as well as large farmers to have an opportunity to compete therefor; and in making their awards special reference shall be had to the profits which may accrue, or be likely to accrue, from the improved mode of raising the crop, or of improving the soil or stock, or of the fabrication of the articles thus offered, with the intention that the premium shall be given for the most economical mode of improvement; and that all persons offering to compete for premiums, on improved modes of tillage, or the production of any crops, or other articles, shall be required, before such premiums are adjusted, to deliver to the awarding committee a full and correct statement of the process of such mode of tillage or production, and the expense and value of the same, with a view of showing accurately the profits derived or expected to be derived therefrom.

SEC. 3. It shall be the duty of each county or district society to publish annually a list of the awards, and an abstract of the treasurer's account, in a newspaper of the district; and to make a report of their proceedings during the year, and a synopsis of the awards for improvements in agriculture, and household manufactures, together with an abstract of the several descriptions of those improvements, and also make a report of the condition of agriculture in their county or district, which reports shall be made out in accordance with the rules and regulations of the Ohio State Board of Agriculture, and shall be forwarded to the State Board at their annual meeting in December, in each year; and no subsequent payment shall be made from the county treasurer, unless a certificate is presented to the auditor from the president of the State Board, showing that such reports have been duly made.

SEC. 4 enumerates the Incorporators.

SEC. 5. It shall be the duty of said Board, or any ten of them, to meet in the city of Columbus, on the first Wednesday of April, after the passage of this act, and to organize by appointing a president, secretary and treasurer, and such other officers as they may deem necessary, also determining by lot the time that each member shall serve, so that the term of service of one-half of the members shall expire annually, on the day of the annual meeting in December; and the president shall have power to call meetings of the Board whenever he may deem it expedient.

SEC. 6. There shall be held in the city of Columbus, on the first Wednesday after the first Monday in December, an annual meeting of the Ohio State Board of Agriculture, together with the president of each County Agricultural Society, or other delegates therefrom, duly authorized, who shall, for the time being, be ex-officio members of the State Board of Agriculture, for the purpose of deliberation and consultation as to the wants, prospects and condition of the agricultural interest throughout the State; and at such annual meeting the several reports from the county societies shall be delivered to the president of the Ohio State Board of Agriculture; and the said president and delegates shall, at this meeting, elect suitable persons to fill all vacancies in the Ohio State Board of Agriculture.

SEC. 7. And it shall be the duty of said Board to make an annual report to the General Assembly of the State, embracing the proceedings of the Board for the past year, and an abstract of the proceedings of the several agricultural societies, as well as a general view of the condition of agriculture throughout the State, accompanied by such recommendations as they may deem interesting and useful.

SEC. 8. That the act to authorize and encourage the establishment of agricultural societies in this State, and for other purposes therein set forth, passed March twelfth, one thousand eight hundred and thirty-nine, be and the same is hereby repealed; provided the acts done, obligations incurred, and rights acquired under the provisions thereof, shall remain in no wise altered or affected by this act.

AN ACT

To amend an act entitled "an act for the encouragement of agriculture," passed February 27, 1846.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That the "Ohio State Board of Agriculture" shall consist of ten members, five of whom shall constitute a quorum.

SEC. 2. That Allen Trimble, M. L. Sullivant, Samuel Medary, Darius Lapham, A. E. Strickle, Arthur Watts, M. B. Bateham, John Codding, Jared P. Kirtland and I. Moore be continued members of the Board, the term of service and the mode of appointing their successors to remain unaltered by this act.

SEC. 3. That the sum of two hundred dollars be and the same is hereby appropriated from the treasury for the use of the Board; and an account of the expenditures of the Board shall be included in the annual report of the Board to the General Assembly.

SEC. 4. So much of the law to which this is an amendment, as conflicts with the provisions of this act, is hereby repealed.

AN ACT

To create a permanent agricultural fund for the State of Ohio.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That there shall be created, from the several sources hereinafter mentioned, a fund, which shall be known as the "State Agricultural Fund."

SEC. 2. That the minimum amount authorized to be charged by county auditors for permits under the law passed February eighth, one thousand eight hundred and thirty-one, entitled "an act to regulate public shows," shall be and is hereby increased to twenty dollars, and that one half the revenue in each and every county, derived from such source, be set apart to the "State Agricultural Fund," to be paid over by the county treasurer to the Treasurer of State, at their settlements with the Auditor of State, as other moneys collected for that purpose now are; and that the other half remain, as now provided by law, for the use and benefit of the common school fund.

SEC. 3. That whenever any real or personal property shall escheat to the State, under the eighth and ninth sections of an act entitled "an act regulating descents and the distribution of personal estates," passed February twenty-fourth, one thousand eight hundred and thirty-one, and all such as have heretofore so escheated under the provisions of said law, and which have been taken possession of under the law entitled "an act concerning escheated lands," passed February twenty-five, one thousand eight hundred and thirty-three, shall be taken possession of in the name of the State, by the county auditor of the county in which such property may be found, and by him sold at public auction, at the county seat of such county, to the highest bidder, after having given thirty days' notice of such intended sale, in some newspaper printed within the county.

SEC. 4. The court of common pleas shall, on the application of the county auditor, appoint three disinterested freeholders of the county to appraise such real property, who shall be governed by the same rules as appraisers in sheriff's or administrator's sales; and the auditor shall sell such property at not less than two-thirds its appraised value, and may, at his discretion, sell the same for cash, or one-third cash, and the balance in equal annual payments; the deferred payments to be amply secured; and, upon the payment of the whole amount of consideration money, shall execute a deed to the purchaser, in the name and on behalf of the State of Ohio.

SEC. 5. All moneys arising from sales under this act, shall be paid over by the county auditor to the treasurer of the county, to be by him accounted for and paid into the State treasury at his annual settlement with the Auditor of State, as other moneys collected for State purposes for the use and benefit of the "State Agricultural Fund."

SEC. 6. The fund hereby created shall be at the disposal of the State Board of Agriculture, for the improvement of the agricultural interests of the State, in such manner as they may deem most conducive to that object, until otherwise provided for by legislative enactment; and shall at all times be held subject, upon such property being reclaimed by any heir, to the payment to the purchaser of the State, of the original purchase money and legal interest, to the time of such reclamation.

(Sections seven to ten inclusive relate to the use of escheated lands in the city of Cincinnati, for the benefit of the "house of correction," established there.)

SEC. 11. All acts and parts of acts inconsistent with this act are hereby repealed.

Passed February 8, 1847.

AN ACT

To protect agricultural fairs and fair grounds.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That it shall be lawful for any justice of the peace, on the application of any of the officers of any State, county, township, or any independent agricultural societies, or industrial associations, to appoint a suitable number of special constables, to assist in keeping the peace during the time when such society shall be holding their annual fairs, and make an entry in his docket of the number and names of all such he shall appoint.

SEC. 2. All such constables so appointed shall have all the power of constables to suppress riots, disturbances and breaches of the peace; they may, upon view, arrest any person or persons who may be guilty of violating any of the laws of the State, may pursue and arrest any person fleeing from justice in any part of the State; to apprehend any and all persons in the act of committing any offense against the laws thereof, and may, upon reasonable information, supported by affidavit, procure process for the arrest of any person or persons who may be charged with a breach of the peace, and forthwith bring such person or persons before the competent authority, and enforce all the laws for the preservation of good order.

SEC. 3. No person shall be allowed to keep any shop, booth, tent, wagon, or other carriage, vessel or boat, or any stand or table for the sale of any spirituous or other liquors, or sell, or expose to sale, give, barter or otherwise dispose of, in or near such shop, booth, tent, wagon, or other carriage, vessel, boat, stand or table, or in any other way or place, any spirituous or other liquors, at or within the distance of two miles from the place where any such agricultural fairs are held.

SEC. 4. That any person or persons who shall be guilty of a breach of this act, and shall be notified by any one of the officers authorized to make an arrest or seizure, or by any other person, that he, she or they are violating the law, and if, after such notice, such person shall continue in such violation, he, she or they shall forfeit and pay for such offense, a fine of not less than five nor more than fifty dollars, to be paid over to the treasury of such agricultural society where the offense was committed; and any judge of the court, sheriff, coroner, justice of the peace of the proper county, or any constable of the proper township, or the constables specially appointed, shall, upon view or information, without warrant, apprehend any person so offending, and seize such booth, tent or wagon, or other carriage, stand, vessel or boat, selling spirituous or other liquors, and convey the same to a place of safe keeping, and take the person so offending before some officer having competent jurisdiction, together with an inventory of the things so seized, and the officer before whom such alleged offender shall be brought, shall proceed forthwith to inquire into the truth of the accusation, and if true, shall enforce the penalties of this act.

SEC. 5. If the accused shall fail to pay such fines as shall be assessed, together with all of the costs of proceedings, including the necessary expenses of such seizure, the said officer before whom such offender was tried, shall forthwith issue a venditioni exponas, commanding any constable of the township in which such inquiry shall be held, to make the fine and costs, necessary expenses, and costs of execution, by sale of so much of the property as shall be necessary therefor, and make return thereof within ten days thereafter.

SEC. 6. That in the execution of the venditioni exponas, the said constable, at least ten days before the sale, shall advertise the property to be sold at two of the most public places of the township, where the same is to be sold, at one of which places, to be designated in the notice, between the hours of ten o'clock A. M. and four o'clock P. M., said sale shall be held; said constable first selling or offering for sale the articles which the offender brought on to the ground for traffic, and the overplus of the property so seized as aforesaid, after the satisfaction of said venditioni exponas, shall be delivered to the defendant, on demand; but if he shall fail to demand the same for ten days after such sale, the same shall become forfeited to the said agricultural society, and if the property so seized shall be found insufficient to satisfy said venditioni exponas and costs of execution, said justice of the peace shall, at any time thereafter, on request of the treasurer of said society, issue a fieri facias to collect the balance thereof.

Passed April 11, 1856.

AN ACT

To amend section three and section six of an act for the encouragement of agriculture, passed February 28, 1846.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio,* That section three of the above recited act be amended so as to read as follows: It shall be the duty of each county or district society to publish annually a list of awards, and an abstract of the treasurer's account in a newspaper of the district; and to make a report of their proceedings during the year, and a synopsis of the awards for improvement in agriculture and household manufactures, together with an abstract of the several descriptions of these improvements, and also make a report of the condition of agriculture in their county or district; which reports shall be made out in accordance with the rules and regulations of the Ohio State Board of Agriculture, and shall be forwarded to the State Board at their annual meeting in January in each year; and no subsequent payment shall be made from the county treasury unless a certificate be presented to the auditor, from the president of the State Board, showing that such reports have been made.

SEC. 2. That section six be amended so as to read as follows: There shall be held in the city of Columbus on the first Wednesday after the first Monday in January, an annual meeting of the Ohio State Board of Agriculture, together with the president of each county agricultural society, or their delegate therefrom duly authorized, who shall for the time being be ex-officio members of the State Board of Agriculture, for the purpose of deliberation and consultation as to the wants, prospects, and condition of the agricultural interests throughout the State; and at such annual meeting the several reports from the county societies shall be delivered to the president of the Ohio State Board of Agriculture, and the said president and delegates shall at this meeting elect suitable persons to fill all vacancies in the Ohio State Board of Agriculture.

SEC. 3. That sections three and six be and the same are hereby repealed.

SEC. 4. This act shall take effect and be in force from and after its passage.

Passed February 20, 1861.

AN ACT

To protect agricultural fairs.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That it shall be unlawful for any person to exhibit or show any natural or artificial curiosity for any price or gain, or shall set up to let or use for profit any swing, revolving swing, flying horses, or whirligigs, within one-fourth of a mile of the fair ground of any agricultural society in this State, while the fair of such society is being held therein, unless such person shall first have obtained the written permission of the Board of such agricultural society to make such exhibition.

SEC. 2. That if any person shall violate the provisions of this act, he shall, on conviction thereof, be fined in any sum not less than one nor more than one hundred dollars; and all moneys derived from the violation of this act shall be appropriated to the support of common schools.

SEC. 3. This act shall take effect from and after its passage.

Passed April 6, 1861.

AN ACT

To provide for the creation and regulation of township agricultural societies.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That when any number of natural persons of any township in the State of Ohio shall form an association for the promotion of agriculture in such township, and shall, under their hands and seals, make a certificate. and acknowledge the same before a justice of the peace, in which shall be specified the name of the society, the objects of its formation, and the township in which it shall be located, and shall record the same in the recorder's office of the proper county, such society shall be deemed a body corporate, with succession, and with power to sue and be sued, plead and be impleaded, defend and be defended, contract and be contracted with; to make and use a common seal, and the same to alter at pleasure; and shall have power to purchase and hold, in fee simple, or to rent or lease such real estate as may be required as a site for holding fairs, not exceeding twenty acres, and to establish all necessary rules and regulations for the management of such fairs, and the legitimate business of the society.

SEC. 2. This act shall take effect on and after its passage.

Passed May 1, 1861.

LAW RELATING TO PUBLIC SHOWS.

AN ACT

To amend an act entitled "an act to regulate public shows," passed February 28, 1831.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That so much of the first section of the act to which this is an amendment, as provides that it shall not be necessary for any exhibiter or exhibiters of any show allowed to be exhibited by said act, to obtain a permit from the county auditor, to show or exhibit in any incorporated town or city, where by the laws or ordinance of such town or city, such exhibiter or exhibiters may be required to obtain a permit or license from the municipal authority of said town or city, be and the same is hereby repealed.

SEC. 2. Before any person or persons shall be permitted to exhibit any public show in any incorporated town or city in this State, he or they shall first be required to obtain a permit from the auditor of the county in which such town or city may be located, according to the provisions of the act to which this is an amendment, and the act to create a permanent agricultural fund, passed February 6, 1847, and all moneys paid into the treasuries of the several counties under the provisions of this act, shall be paid over and disposed of according to the provisions of the act above named.

SEC. 3. Nothing in this act shall be construed to interfere with the right or power of any incorporated town or city of this State, to impose a license upon all shows exhibited in such town or city in addition to that imposed by this act.

Passed March 21, 1849.

AN ACT

In relation to statistics of agricultural and mineral products.

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That it shall be the duty of the several township assessors in all the counties in the State, at the time of making the annual assessment of personal property for taxation, to collect the following items of statistics in addition to those already authorized by law, viz:

First—The number of acres grown in clover, the number of tons of hay made from it, the number of bushels of seed obtained, and the number of acres of clover plowed under for manure.

Second—The number of acres planted in tobacco, and the number of pounds obtained.

Third—The number of (old and young) dogs, both male and female.

Fourth—The number of tons of pig-iron manufactured, and the bushels of stone-coal dug.

Fifth—The number of acres sown in flax, number of pounds of fibre gathered, and the number of bushels of seed obtained.

Sixth—The number of acres planted in sorgo, the number of gallons of syrup manufactured, and the number of pounds of sugar obtained.

Seventh—The number of pounds of maple sugar made, and the number of gallons of syrup manufactured.

Eighth—The number of pounds each of butter and cheese manufactured.

Ninth—The number of acres planted in potatoes, and the number of bushels obtained; and make a correct return thereof to the county auditors of their respective counties at the same time that a return of the enlisted property is made.

SEC. 2. That it shall be the duty of the county auditors to forward annually, on or before the first day of June, to the office of the Ohio State Board of Agriculture, the aggregate of each of the items of statistics enumerated in the first section of this act, together with the aggregate of each and every item of statistics of acreage and product, where acreage is enumerated, and the aggregate product where no acreage is enumerated, of all the agricultural statistics by law authorized to be returned to the auditor of state; together with the aggregate number and value of the horses, cattle, sheep and swine in the county, as sent to the office of state auditor.

SEC. 3. This act to take effect from and after its passage.

Passed February 20, 1864.

AN ACT

To create a permanent fund for the Ohio State Board of Agriculture.

WHEREAS, on the 8th day of February, A. D. 1847, a bill was passed by the Ohio legislature, entitled "An act to create a permanent agricultural fund in the state of Ohio, and for other purposes;" which bill provides that the minimum of show licenses shall be twenty dollars, and that one-half of the fund arising from show licenses throughout the state shall be set apart for the state agricultural fund; and said bill furthermore provides, that the fund arising from the sale of escheated lands shall also be set apart for the state agricultural fund; and,

Whereas, the aforesaid bill exonerates Hamilton county from the payment into the state treasury for the agricultural fund, of any portion of the show licenses or escheats acquired within said county of Hamilton; and,

Whereas, on the 29th of March, 1856, a bill was passed by the legislature of Ohio, authorizing the sum of six hundred dollars to be retained in the county in which an escheat might transpire; and,

Whereas, on the 16th day of April, 1862, the legislature of Ohio passed a bill which, in effect, virtually deprives the fund arising from escheat from passing into the state treasury for the benefit of said agricultural fund; and,

Whereas, the Ohio State Board of Agriculture has derived an annual average sum of two thousand seven hundred and sixty dollars from the two sources of revenue indicated or authorized by the act of February 8, 1847: Therefore,

SECTION 1. *Be it enacted by the General Assembly of the State of Ohio*, That there is hereby appropriated from the general revenue not otherwise appropriated, for each of the years 1864 and 1865, the sum of three thousand three hundred dollars, for the encouragement and improvement of the agricultural interests of the state, in such manner as the State Board of Agriculture may deem most conducive to that object: Provided, that said State Board of Agriculture shall pay the sum of three hundred dollars annually to the Ohio Pomological Society; and the treasurer of state is hereby directed to pay said sum to the president of the Ohio State Board of Agriculture, on the warrant of the auditor of state.

SEC. 2. That portion of the show license fund heretofore set apart for the state agricultural fund, and the funds arising from the sale of escheated lands set apart for the state agricultural fund, shall be collected as heretofore and paid into the state treasury, and be regarded in every sense as forming a part of the general revenue.

SEC. 3. This act to take effect from and after its passage.

Passed March 31, 1864.